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THE ECONOMICS OF NON-TIMBER FOREST PRODUCTS IN CAMEROON: The Case of *ERU (Gnetum)*

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Abstract

This paper seeks to understand the economics of non-timber forest products, especially *Eru* (*Gnetum*) in the Southwest Region of Cameroon. It uses descriptive and econometric approaches on a stratified random sample of 400 participants, complemented with information from literature to capture the objectives of investigation. Results of the study indicate that the demand for *Eru* is own-price, cross-price inelastic, income elastic; positively related to quality and highly consumed by male than female breadwinner of households in the study area. The study further recognizes the impediments such as shortage of infrastructures, lack of proper sanitation, frequent coercion on participants while conveying the product to the market, absence of government support to participants; and potentials for international trade gains for Cameroon. Thus, it is recommended that Cameroon formalize the *Eru*-trade with importing countries that export other goods whose demand in Cameroon is elastic to improve its balance of payments position and increase its volume of exports and imports.

Key words: Demand, Exploitation, Household, *Gnetum*, Forest, Cameroon.
JEL Classification: H31, Q2, O55.

I. Introduction and Objectives

In 2010, the world's forest area was approximated to 40 million km2 or 31 per cent of the total land mass of the globe [Food and Agriculture Organization (FAO) 2010]. The forest accommodates more than 50 per cent of worldwide biodiversity [Global Forest Watch (GFW) 2000]. Africa alone accounts for 25 per cent of the tropical rainforests of the planet and holds 20 per cent of the world's biodiversity from which more than 66 per cent people derive their survival and livelihoods [Center for International Forestry Research (CIFOR) 2005]. Various forest resources on which people depend for survival are non-timber forest products (NTFPs) including bush meat, tubers, fruits, and vegetables. *Eru* (Gnetum) is one such vegetable. The *Eru*-plant is an ever-green plant mostly found in humid tropical forest zones. In Africa, it is distributed in the humid rainforest zone stretching from southern Nigeria through

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Cameroon, Central African Republic (CAR), Congo, Gabon, and Democratic Republic of Congo (DRC) to Angola [Schippers and Besong (2004)]. *Eru* collectors from the Southwest Region (SWR) of Cameroon harvest it from in and around the forest areas stretching over 9879 km2 of which 4316 km2 in SWR and 5563 km2 in Littoral Region (LTR) [Ndumbe, et al. (2009)].

The *Eru*-plant plays a prominent role in the lives of people living around and beyond the vicinity of forest zones owing to its nutritional, socio-cultural, medicinal, and economic values. In SWR, *Eru* is consumed frequently in households because of its high protein contents and in places where meat or other sources of protein are rare or expensive; for the poor it represents a good substitute. In the region, the eating of *Eru* was primarily associated to the Banyangi people. However currently, almost all socio-ethnic groups living in SWR consume it and today there are rare social events in southern Cameroon where *Eru* is not served. Similarly, almost all restaurants in that part of the country have *Eru* on their daily menu. Further, *Eru* is cooked and sold in motor parks, building sites, workplaces, schools, and markets. *Eru* is also valued for its medicinal benefits as it is often used in treating piles, blood pressure, sore throats, nausea, hemorrhoids, whitlow, and spleens among other ailments. Moreover, the plant is used as an antidote to arrow poison by the pygmies, as dressing to accelerate the maturation of furuncles and as a tisane to ease childbirth [Ewane (2001)]. From the economic perspective, the significance of *Eru* can be appreciated from various angles. *Eru* serves as a source of revenue generation to the economy of countries and regions through trade; it provides employment to people, procures a stable source of income to stakeholders, and enhances households' welfare of participating agents.

The *Eru*-trade assumes a greater significance in Cameroon. In 1992 the exports of *Eru* (from Cameroon to Nigeria) were estimated at 428 tons [FAO (2009), and Ndumbe (2013)]. In 1993, about 600 tons of *Eru* left from Idenau port in SWR to Nigeria [Bokwe and Ngatoum (1994), and Shiembo (1999)]. Also, the market studies showed that Idenau traded 44427 tons in 1997 [(Ndumbe, et al. (2009)], and 25255 tons in 1998 [Ndoye, et al. (1998), and Ingram, et al. (2012)]. As the trade in *Eru* transforms into big business, about 45 to 50 mini-buses, each loaded with 1 to 2 tons of fresh *Eru* from forest areas of LT, Center (CE), East (ES), and SW regions transit through Limbe to the port of Idenau in SWR for export to Nigeria every 3 days a week. At this rate, an average of 95 tons of *Eru* per week or 4940 tons per year is moved into the port [Ewane (2001)]. Another source indicates the average volume of *Eru* traded at the Idenau port market per week reaches 63 tons or 3276 tons per year [Besong, et al. (2001)]. Moreover, it was observed that between 2007 and 2009, an estimated annual flow of 3464 tons of *Eru* transited through Idenau export port to Nigeria. Besides this, other exit points of *Eru* to Nigeria such as Ekondo-Titi, Ekok, and Limbe traded 17 tons, 18 tons and 19 tons respectively, of the commodity annually. Furthermore, collectors from 18 villages in SWR and LTR harvested an average of 2324 tons per year out of which about 528 tons were traded in the markets of Fiango, Muea, Muten-

gene, Tiko, and Limbe in SWR every year [Ingram, et al. (2012)]. Thus, by 2009, the *Eru*-business in Cameroon traded over 4 thousand tons and accounted for roughly 78 per cent of the overall size of transnational trade in *Eru* [Ndumbe (2013)].

Today, the contribution of *Eru*-trade to the economy of regions cannot be underestimated in Cameroon. In the 1990s, the annual revenue realized from *Eru*-business at the Idenau port market was approximated to 1.8 billion FCFA (US$3.6 million), [Bokwe and Ngatoum (1994), and Shiembo (1999)]. However in 2001, the annual revenue from the port dropped to an average of 1.3 billion FCFA (US$2.6 million), [Besong, et al. (2001)]. By passing, it should be noted that in the decades of 1999 to 2009 the contribution of NTFPs to the economy of Northwest Region (NWR) and SWR in Cameroon was 12.3 billion FCFA (US$24.6 million) or about 8 times higher than the 1.6 billion FCFA (US$3.2 million) of industrial timber products [Center for the Environment and Rural Transformation (CERUT) and Advice and Research for Development and Environment [AIDEnvironment (1999), and Ndumbe, et al. (2009)]. This shows that the NTFPs sub-sector has greater value in the livelihood of people, as it represents an important source of employment to many individuals.

Thousands of women and men offering itinerant *Eru*-restaurant services earn a living with the *Eru*-business in SWR and other southern parts of Cameroon [Ewane (2001)]. In Fako Division in SWR, most sellers of *Eru* in the markets are women [Besong, et al. (2001)]. In a nutshell, a minimum of 2150 people are directly and 400 indirectly engaged in the *Eru*-business circuit originating from SW and LT regions of Cameroon. At Idenau for instance, an average of 200 young men and 330 other laborers work 3 days a week in the *Eru*-business of the port. Likewise, about 141 managers from Cameroon are commissioned by the Nigerian unions for buying and transporting *Eru* to the border markets or to Nigeria. In a market survey in SWR and LTR, there were 25 restaurants employing about 63 people for cooking *Eru*-leaf dishes for customers. Overall in 2012, the *Eru*-business engaged about 11700 people [Ingram, et al. (2012)] in the SW and LT regions alone. Thus, it is necessary to mention that *Eru*-business is highly lucrative among people involved in it, as they earn reasonable income from it.

In 1997 for instance, a full-time trader of *Eru* could generate 450 thousands FCFA (US$900) per month in Idenau market [Shiembo (1999)]. In 1997 and 1998, the average profit margin for a trader at Idenau stood at 104575 FCFA (US$209.15) and 86110 FCFA (US$172.22), respectively [Ndumbe, et al. (2009)]. As *Eru* is cooked and sold almost everywhere. A woman collecting 100 bundles in a day and selling each at 100 FCFA (US$0.2) in SWR makes a daily return of 10 thousand FCFA (US$20), which is far above the international daily average income benchmark of US$2 for poverty measurement [Oduro and Aryee (2003)], and World Bank (2014)]. Therefore, as in 2001, a woman harvesting *Eru* from the forest could generate a monthly income of 80 thousand FCFA (US$160) - the collection was usually done 2 days in a week. Also, a woman cooking *Eru* for sale in SWR markets could generate

a monthly income of greater or equal to 144 thousand FCFA (US$288) in rainy season and double the amount in dry season [Besong, et al. (2001)]. On an average, a woman at the bottom of the *Eru*-business value chain makes an annual income of 720 thousand FCFA (US$1440). A manager earns an average of 1.44 million FCFA (US$2880) annually; while exporters of *Eru* from Idenau to Oron make an average profit of 3 million FCFA (US$6 thousand), per annum [Ingram, et al. (2012)]. The annual profit which *Eru*-business procures to harvesters, is about 500 thousand FCFA (US$1thousand), corresponding to a daily return of 1365 FCFA (US$2.73), which is above the poverty line threshold of US$2 per day [Ndumbe, et al. (2009)]. It is reported that women trading *Eru* as harvesters and traders make daily profit margins of US$16 and US$160, respectively, in the main season depending on the market conditions [FAO (2009), and Ndumbe (2013)]. The incomes generated from this business have far-reaching consequences on welfare of the households.

Generally, the *Eru*-business assists many poor households in meeting their basic needs [Ndumbe, et al. (2009)]. Given the average household size of 6 people, the *Eru*-business contributes up to 67 per cent of household income for harvesters, retailers, traders and exporters; for whom it has been a source of income for at least a decade in SW and LT regions. The income earned from this business is used for feeding, safety net provision in low seasons of agricultural output and children's education. Also it contributes on an average of 62 per cent of a harvester's, 75 per cent of retailer's and 58 per cent of exporter's annual incomes [Ingram, et al. (2012)]. However, the will of people for maximum utility and welfare functions from *Eru*-business threatens the survival of the *Eru*-plant and create problems of its sustainability.

Given the afore-mentioned benefits, it is obvious that *Eru*-trade is still going to prosper, as long as the forest produces the plants, on one hand. On the contrary however, there are threats on survival of the plant that may lead to its extinction from the forest as the collectors extract large quantity of the plant every day but there is no replacement in the form of new growth of the plant. Further, the fact is that collectors often tend to uproot the plant [Ewane (2001)], fell the tree supporting the liana or cut the vine entirely [Fuashi (2010)]. This reduces the population of *Eru*-plant from the bush, and makes it very rare. Consequently, collectors have to travel far into the forest before gathering a hand full amount of the commodity [Styslinger (2011)].

Another aspect that fosters looming disappearance of *Eru*-plant is the absence of proper sustainable management policy for the resource, weak implementation of natural resource policies, and neglect of local realities [FAO (2009), and Ndumbe (2013)]. Added to this is the issue of tropical forest degradation in the country which was estimated at 0.14 per cent per year for the period 1990 to 2000 [Duveiller, et al. (2008)]. This may compromise the availability of enough stock of bush products in the forest. Although this threat was voiced out by numerous groups of interest since 1990s, no substantial changes have been observed in Cameroon, as regards the sustainability of NTFPs in general and *Eru* in particular [Nlend (2007), and Ndumbe, et al. (2009)].

The economic importance of *Eru*-plant to the economy of countries, regions, households and people is one of the reasons that prompted the undertaking of research on *Eru* [Shiembo (1999)]. It is graded in the class of 17 most significant and cherished NTFPs in Cameroon [Ingram and Schure (2010)], with diverse roles in livelihoods of farmers [Ndoye and Awono (2007)]. Most studies that examined the significance of *Eru* in Cameroon dwelt mainly on describing the socio-economic benefits of vegetables. This study appreciates the matter by introducing an econometric analysis of the demand for *Eru* to discern responsiveness of demand to small changes in factors influencing its consumption and underlining the implications of the demand for *Eru*. Therefore, the primary objective of this study is to understand the economics of *Eru* in SWR of Cameroon. Other specific objectives include:

- to discuss the distribution circuit of *Eru* and the related impediments,
- to estimate the demand for *Eru*,
- to understand the implications of the demand for *Eru*, and
- to offer policy implications on the exploitation of *Eru* in Cameroon.

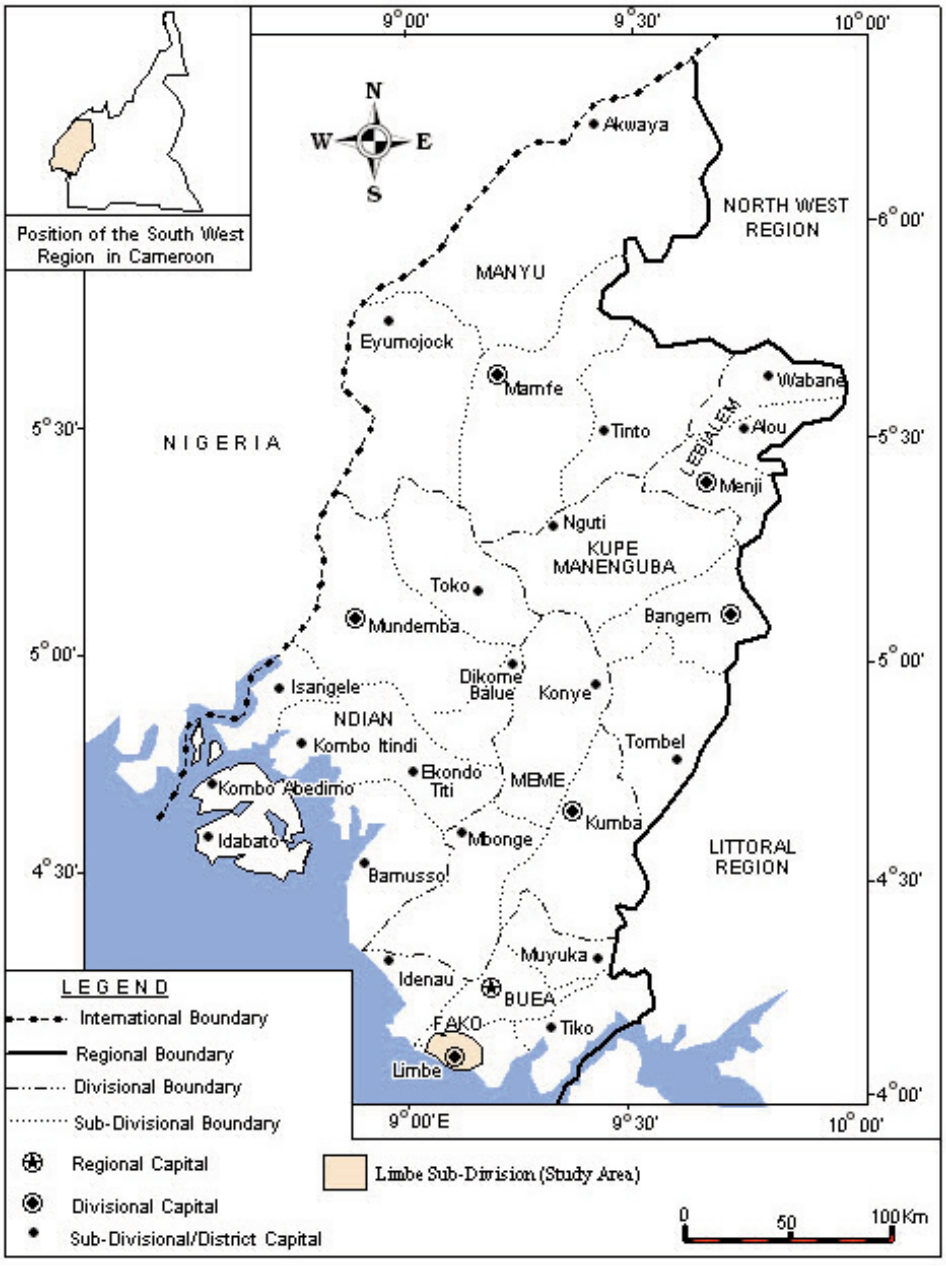
After presenting the introduction and objectives in Section I, the rest of the paper is structured as follows. Section II examines the methodology and Section III describes the model specification; whereas, Section IV covers the results and discussion with reference to the specific objectives of the paper. Section V concludes the study and offers policy implications regarding NTFPs exploitation in Cameroon. At this juncture, there is a need to explain the methodology used to capture the objectives of inquiry.

II. Methodology

This section covers the methodology of the study. It describes the area, explains methods used in collection and analysis of data, and specifies the regression model to be used in the estimation of demand for *Eru* in the study area.

1. Study Materials

République du Cameroun/Programme des Nations Unies pour le Développement (RC/PNUD), (2010), SWR counted 1384286 people in 2010 over its 25410 square kilometers (km^2) land mass. Etan Consulting Engineers (ECE), (2001) situates SWR between latitudes 4° 00” and 6° 50” north of the equator and longitudes 8° 50” and 10° 00” east of the Greenwich meridian (see, Figure 1) and credits it with average daily temperature of 26°C and rainfall variation of 1500 to 3000 mm per annum. Rain Appreciation Society (RAS), (2013) indicates that SWR is home to Debunsha, the 4th rainiest place on earth with 10280 mm of rainfall per annum after Cherrapunji (12650 mm) in India, Mawsynram (11870 mm) in India and Waialeale (11450 mm) in Hawaii, USA, respectively.



Source: Adapted from Mbella, October 2011.

FIGURE 1

Geographical Map of Southwest Region of Cameroon

2. Data and Sampling Procedure

Both the primary and secondary data were used to achieve objectives of this study. The primary data were generated through interviews schedule and personal observations. The interviews were conducted beside 400 participants who were selected at random and split into 4 strata – namely, households that consumed *Eru* (200 participants or 50 per cent of the sample) represented by the household breadwinner, collectors of *Eru* (70 participants or 17.50 per cent of sample), dealers in *Eru*-business (60 participants or 15 per cent of sample) and sellers of *Eru* (70 participants or 17.50 per cent of sample). The secondary data were derived from the vast literature on NTFPs. The paper adopts a multidimensional approach of data analysis blending the descriptive method with econometric approach of inquiry. The descriptive method used analytical tools such as percentages, tables, graphs, mean, variance and range; whilst the econometric approach employed the ordinary least squares (OLS) regression model using STATA statistical and econometric software package for data analysis. Details of the sample study are shown in Table 1.

The variables used to estimate the demand for *Eru* include the price (p) of *Eru*, monthly total expenditure of breadwinner of the household as proxy of income (y), size (z) of the household, average price of substitutes (g) of *Eru*, quality (e) of *Eru* and sex (s) of breadwinner of the household.

Given the failure of small samples to pass the test of econometric analysis, the need to scrutinize the data to overcome this difficulty becomes obvious. A corrective measure was applied to increase the sample size to 200 *Eru*-consuming households' breadwinners. Yet, in spite of this, the attempted regression models satisfied the statistical test but partially satisfied the economic theory test on the explanatory variable 'z' of the household. Hence, a second corrective measure was undertaken by discarding the detrimental and superfluous variables from the models. Thus, the explanatory variable 'z' was discarded from the model because the consumption of much or less *Eru* in meals depends on individual behavior of people rather than the number of peo-

TABLE 1

Sample Stratification and Elements

Stratum	Number	Percentage
Households	200	50.0
Collector	70	17.5
Dealer	60	15.0
Seller	70	17.5
Total	400	100.0

Source: Author, July 2013.

ple in the household; since in a household some members may like eating their meals with much sauce, while others may prefer less sauce. In view of this, the price of *Eru*, income of the breadwinner of household, average price of substitutes of *Eru*, quality of *Eru*, and sex of breadwinner of the household were retained to run the final regression on increased sample to explain the demand (Q) for *Eru*. The descriptive statistics examined with respect to these variables include the mean, median, mode, range and standard deviation.

a) Quantity of Eru

This is the weekly amount of *Eru* consumed as sauce in the households. It is a quantitative and discrete variable measured in kilograms (kgs). The increase of initial sample size from 150 to 200 *Eru*-consuming households reveals some salient features. The weekly average amount of *Eru* consumed declined slightly from 9.460 to 9.187 kgs. Further, the modal quantity reduced from 9 kgs in the initial sample to 6 kgs in the increased sample but the median quantity stood at 9 kgs in both the samples. The standard deviation (SD) moved from 4.062 in the initial sample to 4.038 in the augmented sample. The range remained unchanged at 18. The statistics of the initial and increased samples revealed no major differences between the two situations since the difference between standard deviations of the two samples was very negligible (4.062 – 4.038 = 0.024); hence, the retention of the increased sample of 200 *Eru*-consuming households for the estimation. Next, the study proceeds to presentation of the descriptive statistics of explanatory variables of the estimated model.

b) Price of Eru

This is the rate charged per kg of *Eru*. It is a quantitative and discrete variable, measured in FCFA monetary units at 1 FCFA to US$0.002. Households purchased *Eru* at different prices based on quality of the product and their bargaining power.

In the augmented sample the mean price of *Eru* dropped slightly from 376 FCFA (US$0.752) to 371 FCFA (US$0.742). Further, the modal and median price remained the same at 300 FCFA (US$0.6) and 350 FCFA (US$0.7) in both the samples, while the SD increased from 141.625 (in the initial sample) to 143.743 (in the increased sample). The range remained unchanged at 550 in both samples. A comparison of the SDs shows that difference between the initial and increased samples was just 2.118 (141.625 – 143.743 = – 2.118), hence the retention of the increased sample of 200 *Eru*-consuming households for the estimation. Based on economic theory, the price of *Eru* is expected to be inversely related to quantity demanded for *Eru* and according to the statistics requirements it is anticipated to be highly significant in the regression model. As a result, the price of *Eru* shall take a negative sign with a high statistical t-value.

c) Income of the Household

This is the monthly average earnings of the head of household which is a quantitative and continuous variable, measured in FCFA monetary units. Further, in the initial sample the mean income was 114940 FCFA (US$229.88); the modal and median income were 104800 FCFA (US$209.6) and 112300 FCFA (US$224.6), while the range and SD were computed as 45600 FCFA (US$91.332) and 9653.59; respectively. Conversely, the increased sample yielded a mean income of 114336.50 FCFA (US$228.673), a modal income of 104800 FCFA (US$209.6) and median income of 112000 FCFA (US$224), while the range and SD stood at 45600 FCFA (US$91.332) and 9547.218; respectively. Yet, the difference between the SDs of the 2 samples was significant (9547.218 – 9653.591 = –106.373) due to the enlargement of the initial sample by 33.33 per cent (50 *Eru*-consuming households). Based on economic theory, a direct or positive correlation is expected between income and quantity demanded because *Eru* is perceived as normal good; consequently the income variable must have a positive sign with a high statistical t-value in the estimated model.

d) Price of Substitutes

This represents the rate at which a kg of substitutes of *Eru* is bought by the households from the market. It is a quantitative and discrete variable, measured in FCFA. The substitutes of *Eru* in the study area include bitter leaf (Venonia amygdalina), pumpkin leaf (Cucurbita maxima or Cucurbita moschata), green leaf or African spinach or smooth pigweed (Amaranthus hybridus), cassava leaf (Manihot glaziovii), garden huckleberry, wonderberry, or sunberry (Solanum melanocerasum, S. scabrum, S. burbanki, S intrusum soria), okongobong or fluted pumpkin or fluted gourd leaf (Telfairia occidentalis Hook f), ogbono or bush mango (Irvingia spp.) seeds soup and cabbage (Brassica oleracea). The descriptive statistics of the variable in the initial sample show that the mean price was 426.333 FCFA (US$0.852), the modal and median price were 450 FCFA (US$0.9), the range and SD stood at 450 FCFA (US$0.9) and 136.137, respectively. In the increased sample, these statistics were 412.250 FCFA (US$0.824) for the mean, 300 FCFA (US$0.6) for the mode, 400 FCFA (US$0.9) for the median, 450 FCFA (US$0.9) for the range and 139.063 for the SD. Likewise, a comparison of the SDs of the samples revealed no major difference (136.063 – 139.137 = –3.074); thus, the retention of the increased sample. Here too, economic theory predicts a direct relationship between the price of substitutes of *Eru* and the quantity demanded for *Eru* due to the fact that when a particular good becomes dearer; consumers tend to buy more units of its substitutes, the price of which has fallen. Thus, one expects the price of substitutes of *Eru* to have a positive sign and a high statistical t-value in the estimated model.

e) Quality of Eru

This is the grade or prominence associated with *Eru* consumed in households. It is a qualitative and dummy variable to which binary values of zero (0) and one (1) are assigned for easy recognition of a variable in the estimation process for software as econometric analysis can only understand quantified variables. Two qualifiers were identified as high and low, to distinguish between the grades of *Eru* consumed. The high grade was assigned the value of zero and the low grade the value of one. Although, no meaningful descriptive statistics can be fashioned from this variable, it was observed that the high grade *Eru* was patronized by 46.66 per cent (70 *Eru*-consuming) households, as opposed to 53.33 per cent (80 *Eru*-consuming) households, in the initial sample; as compared to 47.50 per cent (95 *Eru*-consuming) households against 52.50 per cent (105 *Eru*-consuming) households; in the increased sample. There is no economic theory pronouncement on any type of relationship between the quality and demand for goods but it is logical to predict an inverse relationship between the 2 variables. In view of this, the variable quality of *Eru* is predicted to take a negative sign accompanied with a high statistical t-value in the model on the ground that when the quality of *Eru* is low, much of it is acquired.

f) *Sex of Breadwinner of the Household*

It is the state of being a female or male which defines the role, behavior and attributes considered appropriate for women and men in a given society. The word sex is often used interchangeably with gender to avoid polemics on moral or ethical issues. It is a qualitative and dummy variable associated with binary values for easy identification in the estimation model. As a result, a female was given the value of zero and the male associated with the value of one. Since no meaningful descriptive statistics could be created from this variable, one observes that 53.66 per cent (79 *Eru*-consuming) households were led by a female against 47.33 per cent (71 *Eru*-consuming) households led by a male; in the initial sample, in contrast to 53 per cent (106 *Eru*-consuming) households, run by a female; as opposed to 47 per cent (94 *Eru*-consuming) households, run by a male in the increased sample. Although, economic theory is silent about the kind of relationship between the sex variable and the demand for *Eru*, a direct relationship is anticipated between the 2 variables. Therefore, sex variable is expected to assume a positive sign associated with a high statistical t-value, in the estimated model. The descriptive statistics and the expected signs of variables of increased sample are presented in Table 2.

III. Model Specification

The simple linear, semi-logarithm (semi-log), double-logarithm (double-log or log-linear), logit and probit models are common functional forms used in regression analysis. However, not all of them can fit a given set of data and produce the same results.

TABLE 2

Descriptive Statistics and Expected Signs of Estimation Variables of the Demand for *Eru* of Households

Name of Variables	Definition of Variables	Types of Variables	Mean	Median	Mode	Standard Deviation	Range	Expected Signs
Q	Average weekly quantity of *Eru* consumed by households, measured in kilograms (Kg).	Quantitative	9.187	9	6	4.038	18	Positive
P	Average price of *Eru*, measured in Franc de la Communautė Finacière de l'Afrique (FCFA).	Quantitative	371	350	300	143.743	550	Negative
Y	Monthly total expenditure of bread-winner as proxy of income of house-hold, measured in FCFA.	Quantitative	114,336.50	112,000	104,800	9,547.22	45,600	Positive
G	Average price of substitutes of *Eru*, measured in FCFA.	Quantitative	412.5	400	300	139.063	450	Positive
E	Quality of *Eru* (high =0, low = 1).	Qualitative	-	-	-	-	-	Negative
S	Sex (female =0, male =1) of the breadwinner of the household.	Qualitative	-	-	-	-	-	Positive

Source: Sample data, July 2013.

A model of regression analysis provide a meaningful explanation of the studied phenomenon, only when its explanatory variables exerts a positive or negative influence, considerably on the dependent variable and pass both the statistical and economic theory tests of econometric analysis. It implies that the model must yield regression results in which t-values are high (greater or equal to 2); adjusted R-squared is high (at least 0.7), and all coefficients of explanatory variables are preceded with correct signs as postulated by the economic theory. Therefore, after exclusion of the variable – size of the household, the double-log or log-linear model was finally retained. The demand for *Eru* for households in the study area was then taken, in order to fulfill the criteria of both, the statistics and economics. The model considered in final estimation of the demand for *Eru* is presented in Equation (1), after which a section on results and discussion, addresses the specific objectives of the inquiry, accordingly.

$$lnQ = \beta_0 + \beta_1 \ln p + \beta_2 \ln y + \beta_3 \ln g + \beta_4 e_i + \beta_5 s_i + \varepsilon_i \quad (1)$$

where,

ln = Natural logarithm or logarithm at base e,
Q = Average quantity of *Eru* consumed by households in a week, measured in kilograms (kg),
β_0 = Constant term,
$\beta_1 - \beta_5$ = Coefficients on explanatory variables,
p = Average price of *Eru*, measured in FCFA,
y = Monthly total expenditure of breadwinner as proxy of income of household, measured in FCFA,
g = Average price of substitutes of *Eru*, measured in FCFA,
e_i = Quality [high or low] of *Eru*,
s_i = Sex [female or male] of the breadwinner of the household,
ε_i = Error term.

IV. Results and Discussion

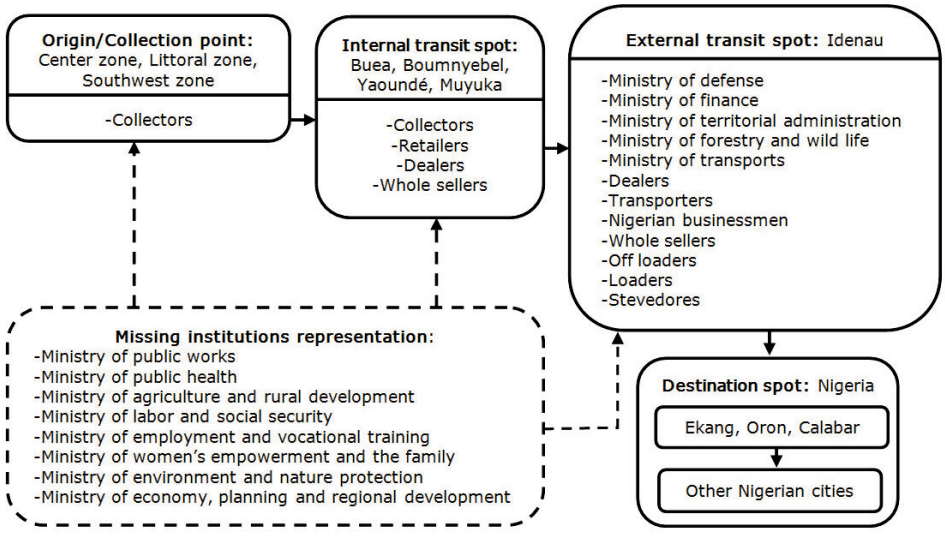
This section covers the results and discussion of the findings. First of all, the distribution circuit of *Eru*-business and the related impediments are discussed; second, the econometric results of the estimated demand for *Eru* presented in Equation (1) are explained.

1. Distribution Circuit and Related Impediments

Figure 2 describes the distribution circuit of *Eru*-business from the collection points in Cameroon to the destination spots in Nigeria. Under normal circum-

stances, *Eru* is harvested from the forest by collectors who take the product to the internal transit points on market days. At the market, the collectors meet with dealers, retailers and whole sellers of *Eru*. After direct or indirect purchase of *Eru* from the collectors or purchase through dealers, retailers take the product to their respective counters in the market and start reselling it to consumers. As regard the whole-sellers, the purchase of *Eru* is mostly done through dealers who organize the needed tonnage, loaders and vehicles to transport the product to the external transit spots. Between the internal transit spots and the external transit points of *Eru* at Idenau, the whole-sellers meet the council's revenue collectors, toll-gate fee collectors, security agents (police, gendarmes, highway agents, road safety agents), and the forestry guards on the way. The duty of security and forestry guards is to ensure the conformity of the contents of cargo loaded into the vehicle and compliance of the whole-sellers (with the authorization permit), governing exploitation of NTFPs in the country. At the Idenau port where *Eru* is off-loaded and loaded into boats for transportation to Nigeria, the whole-sellers meet the port authority agents, council revenue collectors, security agents (police, military), custom people, dealers, off-loaders, loaders, stevedores, boat drivers, bag sellers, forestry guards and the *Eru*-businessmen from Nigeria.

Yet, several other institutions are solicited within the distribution circuit of *Eru*. The missing representations include the ministry of public works which is expected



Source: Adapted from Mbella, October 2011.

FIGURE 2

Distribution Circuit of *Eru*

to construct and maintain roads to facilitate evacuation of *Eru*, from supply points to transit and destination points; the ministry of public health to guarantee health quality requirements of *Eru* being traded; the ministry of agriculture and rural development to encourage large scale domestication of *Eru*; and the ministry of labor and social security to recognize the labor contribution and social security provided to many people in the *Eru*-distribution chain in the country. Other absent representations are the ministry of employment and vocational training which can liaise with the ministry of women's empowerment and family to organize training sessions in favor of the most vulnerable participants at the lower section of the *Eru*-business chain including the poor and women; ministry of environment and nature protection to promote a sustainable harvest of *Eru*; and the ministry of economy, planning, programming and regional development to recognize the socio-economic contribution of *Eru*-business to individuals and economies by formalizing *Eru*-trade between trading countries.

Further, the *Eru*-business is marred with diverse complaints from participants who request the involvement of missing representations, cited earlier into the circuit. Generally, the complaints arise from the supply side of the business which consisted of 50 per cent (200 participants) of the sample study. Table 4 shows that participants advanced 446 cases of complaints. On an average, a participant suffers from 2 types of complaints (446 cases ÷ 200 = 2.23 ≈ 2). Among the complaints, 50.89 per cent (227 cases) relate to lack of proper infrastructure and sanitation (roads, stands, storage devices and hygiene) in business operation spaces (markets and transit spots), 13.22 per cent (59 cases) relate to harassment and extortion of money at check points (forestry guards and security agents) from participants when transporting the *Eru* to the points of sale. Other complaints, such as, lack of support from government for instance, lack of structured associations for participants, scary depletion of forest and insecurity facing collectors in the bush, during the harvest of forest, products accounts for 7.62 per cent (34 cases), 2.91 per cent (13 cases), 18.38 per cent (82 cases), and 6.95 per cent (31 cases), correspondingly.

A careful examination of Table 3 reveals that participants are more worried about inadequacy of infrastructure and sanitation, because the roads they use to access *Eru* and evacuate it to final consumers are bad and storage facilities to condition *Eru* before exportation are dilapidating; environmental concerns for *Eru* is no longer available at the proximity of villages as it used to be, and coercion they are facing due to the presence of many check points along the *Eru* distribution corridors where illegal taxes which increase their expenditures are imposed on them. Yet the participants have expressed little concern about lack of support from the government because of disappointment in government past promises to improve people's welfare, lack of security because of survival needs and lack of organization they face in their activities due to individualistic character of majority of participants.

TABLE 3

Impediments related to the *Eru* business

Complaints	No. of Cases	Percentage
Lack of infrastructures and sanitation services	227	50.89
Check point harassment and extortion	059	13.22
Lack of empowerment	034	07.62
Lack of organization	013	02.91
Forest depletion	082	18.38
Insecurity	031	06.95
Total	446	100.00

Source: Author, July 2013.

2. Results of OLS Double-Log Estimation

The OLS double-log estimation results of *Eru* demand in SWR are presented in Table 4. The results are reported in absolute terms to avoid a cumbersome presentation of the outcomes on coefficients preceded with their appropriate negative signs. A regression coefficient of 0.602, on price in the double-log equation, explains that demand for *Eru* is own-price inelastic at all levels of significance. Equally, a significant regression coefficient of 6.871 (on income) shows that the demand for *Eru* is income elastic at all levels of significance. Moreover, a coefficient of 0.157 on price of substitutes indicates that the demand for *Eru* is substitutes-price inelastic at all levels of significance. Ceteris paribus: These are outcomes which show that a one per cent increase in the price of *Eru* leads to a less than one per cent kg decrease in the demand for *Eru*, a one per cent kg increase in demand for *Eru* results from a more than one per cent increase in income of the breadwinner of a household, and a one per cent increase in the price of *Eru*-substitutes provokes a less than one per cent kg increase in the demand for *Eru*.

Besides, a coefficient of 0.193 on the quality of *Eru* symbolizes differences in the demand for *Eru*; between households that regularly acquired *Eru* of high quality (high = 0) and those households that frequently purchased *Eru* of low quality (low = 1). A comparison of demand for the 2 groups of *Eru* discloses that the demand of households for low-quality *Eru* surpasses that of households for the high-quality *Eru* by 21.33 per cent [100 * (e 0.1933491 – 1)]. Ceteris paribus: The quality of *Eru* was statistically significant at all levels in explaining the demand for *Eru*, meaning that poverty remains a major factor compelling households to trade-off quality for quantity in the study area. Also, a coefficient of 0.154 on sex of the breadwinner of households represent difference in demand for *Eru* between households where

a female (female = 0) assume the responsibility of feeding the household and households led by a male (male = 1). A comparison of demand for *Eru* for the 2 classes reveals that demand of households headed by a male over-shadows households led by a female by 16.75 per cent [100 * (e 0.1549467 – 1)]. Ceteris paribus: The sex of breadwinner turn out to be statistically significant at 5 per cent in explaining the demand for *Eru* which shows that in the study area when eating meals, a male appears to like more sauce than a female. Lastly, an adjusted R-square of 78.41 indicates that the model explains 78.41 per cent of variations in demand for *Eru* of households. The residual 21.59 per cent of the behavior of households in demand for *Eru* was unaccounted for by the model, due to lack of information on other factors influencing the consumption of *Eru* in the area.

In the double-log regression model, coefficients on explanatory variables represent the respective elasticity of demand. As a result, the coefficient of 0.602 on 'p' represents the price elasticity of demand for *Eru* which in this case is inelastic. The implication of this coefficient on the demand for *Eru* is that a slight change of one per cent increase in the price of *Eru* provokes a decrease of 0.602 per cent in the quantity of *Eru* consumed in households, ceteris paribus, given the virtues associated with the plant in the study area and beyond.

Likewise, the coefficient of 6.871 on 'y' symbolizes income elasticity of *Eru*. The magnitude of coefficient categorizes *Eru* as a normal good because more of it is to be consumed in households as the breadwinners' income increases. Yet, normal goods are often classified into necessities (with income elasticity positive but less

TABLE 4

OLS Double-log Estimation Results of Demand (Q) for *Eru* of Households

Estimation Method	OLS: Double-log		Relationship between Variables
Explanatory Variable	Co-efficient	t-stat	Interpretation
lnp	–0.602	–10.85 (0)*	1% ↗ Price → < 1 % Kg ↘ Demand
lny	6.871	23.50 (0)*	1% ↗ Price → > 1 % Kg ↗ Demand
lng	0.157	3.38 (0)*	1% ↗ Price → < 1 % Kg ↗ Demand
e	–0.193	–2.75 (0.7)*	21.33% more of low than high quality *Eru*
s	0.154	2.21 (2.8)**	16.75% more *Eru* intake by male than female
Constant	–75.293	–24.14 (0)*	-
Adjusted R^2	78.41		-
Observations	200		-

Source: Estimation, July 2013. Values in parentheses are p-value percentages.
* Significant at all levels, ** Significant at 5%.

than one), comforts (with income elasticity equal to one), and luxuries (with income elasticity greater than one). *Eru* qualifies as a normal luxury good given the coefficient of 6.871. This is justified by the fact that *Eru* being initially a meal associated with the Bayangi people in Cameroon, has now moved from necessity or comfort good to that of a luxury good over time, due to learning and demonstration effect that changed the consumption pattern of other people by altering their tastes, preferences and choice to adopt *Eru* in their consumption habits. The coefficient further explains that a 6.871 per cent increase in the income of breadwinners of households provokes one per cent increase in consumption level of *Eru* in households, ceteris paribus.

Finally, the coefficient of 0.517 on 'g' symbolizes the cross-elasticity of demand for *Eru* in relation to other vegetables. As the coefficient is positive but less than one, *Eru* and the other vegetables considered in the study are poor substitutes for each other. This implies that one per cent increase in the price of *Eru*-substitutes leads to 0.517 per cent increase in the consumption or demand for *Eru*, all other things being equal. However, this is a unidirectional traffic as the reverse is not always true because a slight change in the price of other vegetables may not necessarily lead to a less than proportionate change in the consumption or demand for *Eru*. As regards the production, this coefficient explains that production of *Eru* faces no competition since it is dictated by nature: thus making the forest a monopoly industry capable of determining its availability and quantity. Based on the results and discussion generated, a general conclusion and a series of policy implications can be drawn in the next section.

V. Conclusion and Policy Implications

This study finds that demand for *Eru* in SWR of Cameroon is own-price inelastic and cross-price inelastic; but income elastic at all levels of significance. These results bear a series of implications on household demand for and production of *Eru* in the study area and the country at large. The implication of the results is that one per cent increase in the price of *Eru* would lead to a decrease of less than one per cent in demand for *Eru*, ceteris paribus; an increase of one per cent in the price of *Eru*-substitutes would decrease the demand for *Eru* by less than one per cent, ceteris paribus. As a result, it is crucial for the country to consider the following proposals.

1. As an important source of employment and income generation for many people, the *Eru*-business needs support from the government given its potential toward combating poverty in low-income households, presenting market opportunities to medium-income households, and improving people's general welfare in both the rural and urban areas of the country. This support entails the construction of tarred roads to ease trading activities, building of ultra modern storage facilities at transit and exit points to preserve the quality of *Eru* and the health of

consumers, and maintaining only few check points along the main itineraries of *Eru*-distribution to reduce coercion and collection of illegal taxes from participants on the routes.

2. It is imperative for *Eru*-trade stakeholders to establish an association to enable them to speak in one voice, about the difficulties facing them. This in turn may assist them to gain recognition beside the government and international organizations promoting social welfare advancement matters.
3. As sole producer of *Eru* the forest has the potential to contribute to more wealth creation for the country. This can only be achieved if the methods of harvesting *Eru* from the forest are sustained and supplemented by large scale domestication of the *Eru*-plant; otherwise abusive collection of the plant can deplete the forest.
4. Based on the magnitude of price-elasticity of demand for *Eru*, it is necessary for the government of Cameroon to formalize trade with *Eru*-importing countries that export other goods, the demand of which in Cameroon is elastic to improve its balance of payments position through export receipts; by charging these countries high prices, given the price-inelasticity of demand for *Eru* and paying them less for the goods they export to Cameroon. This can make Cameroon gain both ways in the international trade and increase its volume of exports and imports as well.
5. Given the size of the income-elasticity of demand for *Eru*, there is a need for the government of Cameroon to increase people's incomes in the country to encourage the consumption of *Eru* which is a normal good. This in turn may stimulate potential growers to embark on large scale domestication of *Eru* and reduce the pressure of wild harvest of the plant from the forest.
6. The degree of the cross-price elasticity of demand for *Eru* suggests that increasing the price of *Eru*-substitutes insignificantly reduces the quantity of *Eru* consumed in households. As a result, any policy with reference to *Eru* should be designed separately from that of the other vegetables.

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APPENDIX

Outcomes of Attempted Regression Models on Increased Sample of 200 Households

TABLE A-1

Simple Linear Model on Increased Sample of 200 Data with all Explanatory Variables

```
reg Q p y g z e s
------------------------------------------------------------------------------
      Source |       SS       df       MS              Number of obs =     200
-------------+------------------------------           F(  6,   193) =  304.44
       Model |  2935.55319     6  489.258865           Prob > F      =  0.0000
    Residual |  310.165562   193  1.60707545           R-squared     =  0.9044
-------------+------------------------------           Adj R-squared =  0.9015
       Total |  3245.71875   199  16.3101445           Root MSE      =  1.2677

------------------------------------------------------------------------------
         Q   |      Coef.    Std. Err.      t      P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         p   |   -0.018731   0.0010432   -17.95   0.000    -0.0207886   -0.0166734
         y   |    0.000563   0.0000144    39.07   0.000     0.0005345    0.0005914
         g   |   0.0013868   0.0006643     2.09   0.038     0.0000767    0.002697
         z   |  -0.0671046   0.0514598    -1.30   0.194    -0.1686005    0.0343913
         e   |  -0.3991422   0.4074512    -0.98   0.329    -1.202771     0.4044867
         s   |   0.3905594   0.4052038     0.96   0.336    -0.4086368     1.189756
       _cons |  -48.47709    1.3931830   -34.80   0.000    -51.22491     -45.72927
------------------------------------------------------------------------------
```

TABLE A-2

Simple Linear Model on Increased Sample of 200 Data with All Explanatory Variables Excluding the Size of Household

```
. reg Q p y g e s
------------------------------------------------------------------------------
      Source |       SS       df       MS              Number of obs =     200
-------------+------------------------------           F(  5,   194) =  363.68
       Model |  2932.82041     5  586.564082           Prob > F      =  0.0000
    Residual |  312.898339   194  1.61287803           R-squared     =  0.9036
-------------+------------------------------           Adj R-squared =  0.9011
       Total |  3245.71875   199  16.3101445           Root MSE      =    1.27

------------------------------------------------------------------------------
         Q   |      Coef.    Std. Err.      t      P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         p   |  -0.0192799   0.0009562   -20.16   0.000    -0.0211659    -0.017394
         y   |   0.0005642   0.0000144    39.17   0.000     0.0005358    0.0005926
         g   |    0.001493   0.0006604     2.26   0.025     0.0001905    0.0027956
         e   |  -0.4347851   0.4072666    -1.07   0.287     -1.238024    0.3684536
         s   |   0.4025401   0.4058303     0.99   0.322    -0.3978658     1.202946
       _cons |   -48.74371   1.380584    -35.31   0.000     -51.46659    -46.02083
------------------------------------------------------------------------------
```

TABLE A-3

Semi-Log Model on Increased Sample of 200 Data with All Explanatory Variables Excluding the Size of Household (Dependent Variable Logged but Explanatory Variables not Logged)

```
. reg lnQ p y g e s

      Source |       SS       df       MS              Number of obs =     200
-------------+------------------------------           F(  5,   194) =  148.49
       Model |  35.3442133     5   7.06884267           Prob > F      =  0.0000
    Residual |  9.23514254   194  0.047603828           R-squared     =  0.7928
-------------+------------------------------           Adj R-squared =  0.7875
       Total |  44.5793559   199  0.224016864           Root MSE      =  0.21818

------------------------------------------------------------------------------
         lnQ |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           p |  -0.0019588   0.0001643   -11.92   0.000    -0.0022828   -0.0016348
           y |   0.0000601   2.47e-06     24.28   0.000     0.0000552     0.000065
           g |   0.0003732   0.0001135     3.29   0.001     0.0001494     0.000597
           e |  -0.1578126   0.0699679    -2.26   0.025    -0.2958081   -0.0198171
           s |   0.1593235   0.0697212     2.29   0.023     0.0218147    0.2968322
       _cons |   -4.174309   0.2371826   -17.60   0.000     -4.642097    -3.706521
------------------------------------------------------------------------------
```

TABLE A-4

Semi-Log Model on Increased Sample of 200 Data with All Explanatory Variables Excluding the Size of Household (Dependent Variable not Logged but Explanatory Variables Logged)

```
. reg Q lnp lny lng e s
------------------------------------------------------------------------------
      Source |       SS       df       MS              Number of obs =     200
-------------+------------------------------           F(  5,   194) =  276.41
       Model |   2846.1936     5   569.23872           Prob > F      =  0.0000
    Residual |  399.525152   194    2.059408           R-squared     =  0.8769
-------------+------------------------------           Adj R-squared =  0.8737
       Total |  3245.71875   199  16.3101445           Root MSE      =  1.4351

------------------------------------------------------------------------------
           Q |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lnp |   -5.89867   .3625896   -16.27   0.000    -6.613794   -5.183547
         lny |   64.08345   1.907907    33.59   0.000     60.32055    67.84635
         lng |   0.5245974   0.3048583     1.72   0.087    -0.0766648     1.12586
           e |  -0.7471074   0.4593978    -1.63   0.106    -1.653163    0.1589479
           s |   0.3201214   0.4578713     0.70   0.485    -0.5829233    1.223166
       _cons |  -705.4423   20.35621   -34.65   0.000    -745.5902   -665.2944
------------------------------------------------------------------------------
```

TABLE A-5

Double-Log Model on Increased Sample of 200 Data with All Explanatory Variables Excluding the Size of Household: Reported

```
. reg lnQ lnp lny lng e s
------------------------------------------------------------------------------
      Source |       SS       df       MS              Number of obs =     200
-------------+------------------------------           F(  5,   194) =  145.54
       Model |  35.1960229     5  7.03920457           Prob > F      =  0.0000
    Residual |  9.38333302   194  .048367696           R-squared     =  0.7895
-------------+------------------------------           Adj R-squared =  0.7841
       Total |  44.5793559   199  .224016864           Root MSE      =  .21993

------------------------------------------------------------------------------
       lnQ   |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lnp   |  -.6028198   .0555676   -10.85   0.000     -.712414   -.4932256
       lny   |   6.871884   .2923908    23.50   0.000     6.295211    7.448556
       lng   |   .1577411   .0467202     3.38   0.001     .0655964    .2498858
         e   |  -.1933491   .0704037    -2.75   0.007     -.332204   -.0544942
         s   |   .1549467   .0701698     2.21   0.028     .0165532    .2933403
       _cons |  -75.29317   3.119633   -24.14   0.000    -81.44592   -69.14042
------------------------------------------------------------------------------
```