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Consumer willingness to pay for attributes of west-African poultry: using the microeconometrics of implicit price

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Abstract
Consumer concerns in food purchasing contain a number of attributes, including the nutritional and sanitary values, conditions of breeding and selling, and other social issues. The purpose of this paper is to introduce an analytical and an empirical approaches to estimating the marginal willingness to pay (WTP) for chicken attributes in Cameroon using data from an investigation on the field. First we constructed a theoretical model of implicit price. Secondly, we assumed that WTP for chicken attributes can be derived from estimate hedonic function, there by expressing the prices consumers are willing to pay as function of implicit price of each chicken attributes. Two models are proposed and discussed. Our findings indicate that in spite of the possibility of bargaining the price of the local flesh chicken, consumer's substituted it by imported frozen cut chicken which main attributes are low cost, sold in separated parts and available in all urban markets.
Key words: West Africa, attributes, poultry, marginal willingness to pay, implicit price.
JEL codes: C5, D12, Q18

1. Introduction

This paper is written in a context where, since 1995, the Cameroonian flesh chicken production of is strongly competed by the low prices of imported frozen cut chicken coming from Europe or Brazil (Awono, 2008). This movement was accompanied by a strong fall of chicken prices, causing collapse of many local poultry farms. The situation was reported and condemned by the local actors and international non governmental organisations.

An empirical analysis of the urban chicken consumption in Cameroun seems to indicate that it is over-simplistic to consider chicken as a homogeneous product, insofar as imported frozen cut chicken targets different consumers and it doesn't compete with local markets (Awono et *al*, 2008 ; Awono, 2008). Though both types of chickens bring some meat, sources of calories and proteins to the consumers, other attributes of consumption differentiate in their eyes. However, the analysis of satisfaction of food needs of developing countries population traditionally limits itself to the analysis of the total offer and it often forgets the differentiation of products.

In what follows, we first investigate on the field to identify and studying factors consumers' perception for specific attributes will influencing prices in Cameroon. Next, we constructed a theoretical model of willingness to pay (or hedonic price) by taken in account the traditional or informal market (qualified as imperfect) of Cameroon to interpret our findings: so, we assumed the segmentation of markets and the consumer never has the perfect information concerning attributes of chicken sold. Contrary to develop countries, prices are not posted, consumer has to bargain the price every time, place of sale can influenced the price of chicken and other socio-economics characteristics or attributes can always influenced the choice and the price of the chicken. This model also takes in account the purchasing power of consumers in local market. At last, with available data collected, we measured the marginal willingness to pay by applying the hedonic method based on intrinsic and extrinsic attributes of chicken.

The remaining text is subdivided into four sections in addition to the present introduction. In section 2, we present the data collected, and then we developed the analytical method. Section 3 is devoted to the implementation of an econometric method as well as results obtained. Finally in section 4, we conclude and give implications of the paper.

2. Materials and methods

2.1. Source of data

In order to studying relevant characteristics or attributes of chicken as it is perceived by consumers, a specific survey[1] was conducted in two steps in Yaoundé, the capital of West African nation of Cameroon. The first one was a qualitative exploratory survey to categorize chicken sold, consumers and to assume the segmentation of the local markets. After this first stage, formal questionnaire related mainly to chicken consumption was written and applied. During the period May and July 2005, 180 households in Yaoundé were sampled using the quota method (read GRAIS, 2003; ARDILLY, 1994; GROSBRAS, 1987), in other to obtain great variation in term of socio-cultural backgrounds (principal activity, standard of living, level of study, age...).

Contrary to the classic approach which would want that the data are only collected on the attributes of the product, we proposed in an informal market to take into account perceived attributes for which consumer are willing to pay connected to the salesmen and to the buyers: the intrinsic attributes. This is why data were collected considering, extrinsic attributes such as price, practice for cooking (sold in parts), alive (sold by judged), terms of sale (possibility

[1] It would be necessary to add that in reality, the object of this survey at first was not to make an econometric estimate later. It is only several months after the survey, considering the extent of collected data that we decided to estimated a willingness to pay for chicken attributes.

of bargaining, adjournment of payment or handing-over)[2], availability every time and intrinsic attributes such as symbolic value of local chicken (useful for formalities or traditional ceremonies), ethnicity, social report, conditions of breeding (buyer knows the origin of chicken) and taste. Indeed, it important to take into account other socio-economics attributes like age (assumed that possibility of bargaining can increase if the buyer is mature), principal activity (indicate the purchasing power), size of the family (indicate the number of mouth to be nourish) and level of study (indicate if the buyer can have information about the poultry). We assumed that these attributes can give us in our context, the implicit price of the chicken. Collected data are presented on table 1.
According to the nature of available data, hedonic model was tested. This model gives the willingness to pay extrinsic and intrinsic attributes of local chicken or imported chicken.

2.2. Analytical method

A hedonic price model was used to determine the effect of various factors on price. A hedonic price function relates the price of a product (good or a service) to its various attributes or characteristics. Waugh (1928) and later Lancaster (1971) made early attempts to related price to products characteristics. Rosen (1974) and Lucas (1975) advanced those ideas providing a theoretical framework for hedonic price analysis. The underlying hypothesis of such analysis is that the products have utility bearing attributes and that the values of those attributes contribute to the price of the product. The observed product price is therefore a composite of the implicit values of the product's attributes.
In this paper, we assume the imperfection of local markets. Consumer doesn't have information about the product sold, the price is resulting from bargaining and consumer has possibility of handing-over. However, prices are not posted like in developed countries and the product is mostly sold alive and by "judged". This is why we suggest using in this context, characteristics of chicken as well criteria related to choice, the place of sale and to the buyer.

a) The basic model

Assume that consumer's utility is given by: $U = U(\alpha, H, Z)$. Then Z is a composite commodity, α is a vector of socioeconomics characteristics of consumer: age, income, family status, etc.., H is a vector of consumption of a differentiated good used in unit: it is chicken characterised by its attributes x_j, $j = i...J$ where $H(\cdot) = H(x_1,...x_J)$. Assume that the chicken price $P = P(x_1,...x_J)$ is the marginal willingness to pay function or hedonic price of chicken. Under these assumptions, the preferences are weakly separable in consumption of chicken and its attributes. In other words,

$$U(\alpha, H(x_1,...x_J), Z) = U(\alpha, x_1,...x_J, Z) \quad (1)$$

Let us simply assume that consumer can have an uninterrupted range of choice of characteristic and nothing his disposable income W. Her utility-maximisation is given by:

$$\begin{aligned} &\underset{x_1...x_J, Z}{Max}\ U(\alpha, x_1,...x_J, Z) \\ &P(x_1,...x_J) + Z = W \end{aligned} \quad (2)$$

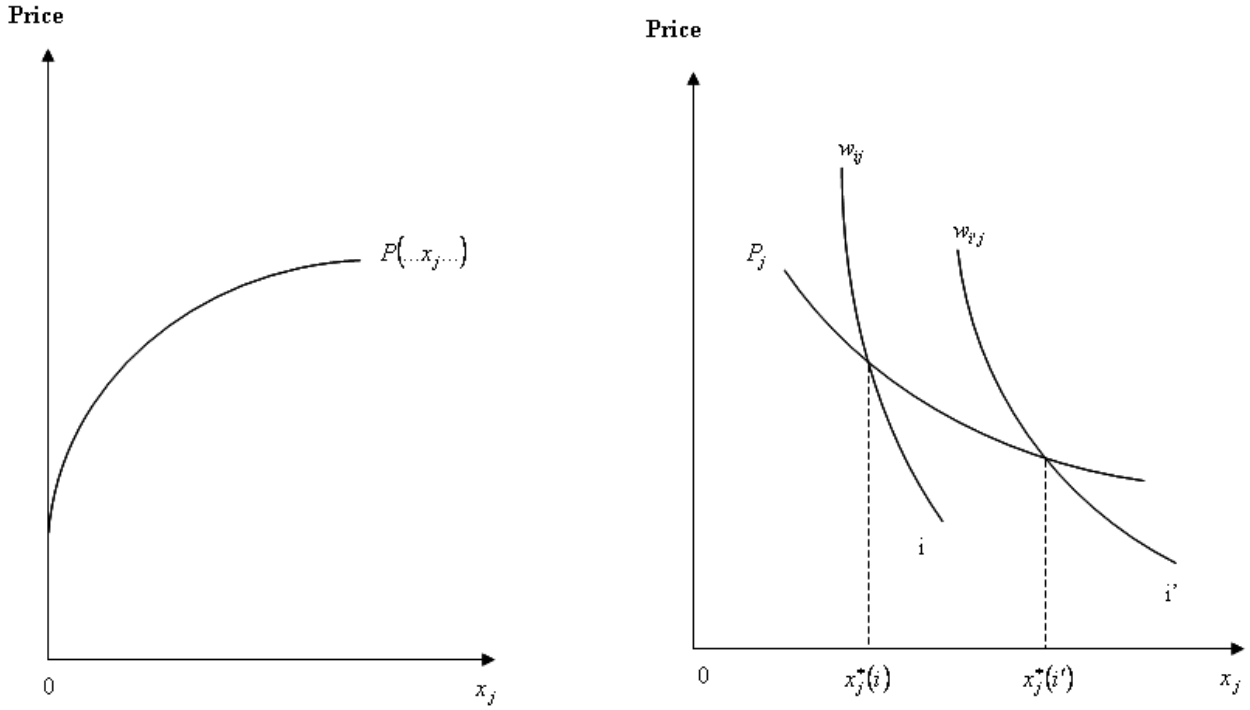
The first-order condition for the price of attributes or in our context willingness to pay (WTP) attributes of chicken is given by:

$$P_j = \frac{\partial P}{\partial x_j} = \frac{U_{x_j}}{U_Z} = w_j \quad j = 1..J \quad (3)$$

[2] The fact of knowing that one can negotiate the price or report the payment for another day is very important for households with very low income on the African markets

Assume now that the hedonic price function P_j has been estimated for the marginal willingness to pay for attribute x_j. It is, in optimum, equal to the marginal rate of substitution between these characteristics and the composite good, it is also equal to the marginal willingness to pay of consumer w_j.

The consumer is assumed to be a price taker in the chicken market, that consumer can be viewed as facing an array of implicit marginal price schedules for various characteristics. Equation (3) shows that consumer maximizes utility by simultaneously moving along each marginal price schedule until she reaches a point where her marginal willingness to pay for an additional unit of that characteristic just equals the marginal implicit price of that characteristic. According to Freeman (1992), figure 1 shows the partial relationship between the hedonic price and x_j. Figure 2 shows the marginal willingness to pay curves for two consumers, i and i', who have chosen utility maximizing bundles of chicken characteristics. Figure 2 represent the resolution of equation 3.



Figures 1 and 2 (According to Freeman, 1993)

According to Rosen (1974), the behaviour of the consumer can again also be represented as a bidding function $\theta(x, u, W, \alpha)$ representing the willingness to pay for chicken's characteristics $x = x(x_1, \ldots x_j)$ considering an income W and a level of utility u.This bidding function is defined implicitly by following equation:

$U(x, x_1, \ldots x_j, W - \theta)$ (4)

Marginal bidding, $\theta = \dfrac{\partial \theta}{\partial x_j}$, is equal to the marginal rate of substitution $\dfrac{U_{x_j}}{U_z}$ defined before.

In a symmetrical way and as also represented it by Rosen before, the hedonic price of the chicken can be also interpreted as a bidding of offer.

b) The imperfection of the market

Considering the marginal implicit price of characteristic x_j as the effective marginal willingness to pay of the consumer for this attribute is subject of controversy (Freeman, 1993; Bonnieux and Desaigues, 1996). Even more so in our case, like in African market, consumers are not better informed about chicken attributes. Then, price-taker hypothesis is particularly arguable in Africa, notably as much as, during the purchase of poultry; the consumer and the seller are practically in a situation of bilateral monopoly: each participates in the building of price which results from bargaining. Finally, the resolution of equation (2) assumed an uninterrupted range of choice of attributes. And, in the reality of the Cameroonian market, the most part of attributes cover only a restricted range and drive to a discrete choice. In most cases, consumer is theoretically willing to pay more a lot a product likely to bring him the upper quantity of a particular attribute, but that such attribute is not available on the market. Figure 3 illustrates this scenario. Figure 3 shows the marginal implicit price function $P_j(x_j)$ and estimated marginal willingness to pay functions for high income $w_{j'}$ and low income w_j. Then, the attribute x_j being available only for $x_j \leq \overline{x_j}$. Beyond $\overline{x_j}$, the curve P_j is cut-down in the point A: $\overline{x_j}$ is the maximum quantity x_j that the product is in measure to offer.

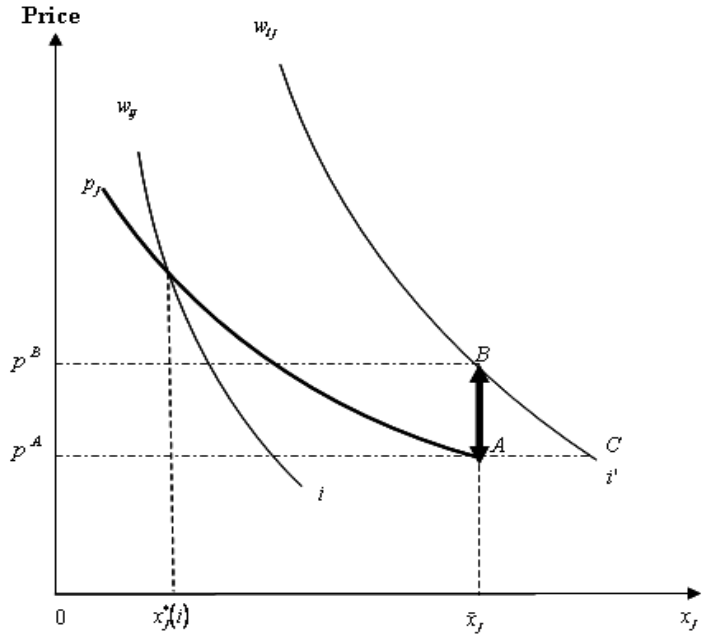


Figure 3 (According to Freeman, on 1993)

Another scenario (which is not symmetrical therefore to figure 3), illustrated in the figure 4, is when the marginal willingness to pay w_{ij} of low income i is less than price P_j. The absence of intersection between P_j and w_{ij}, point out that low income i can not obtain the main attribute x_j. Then, if want any more to eat chicken which is the less expensive meat, he have to buy a substitute chicken (imported) not introducing this attribute.

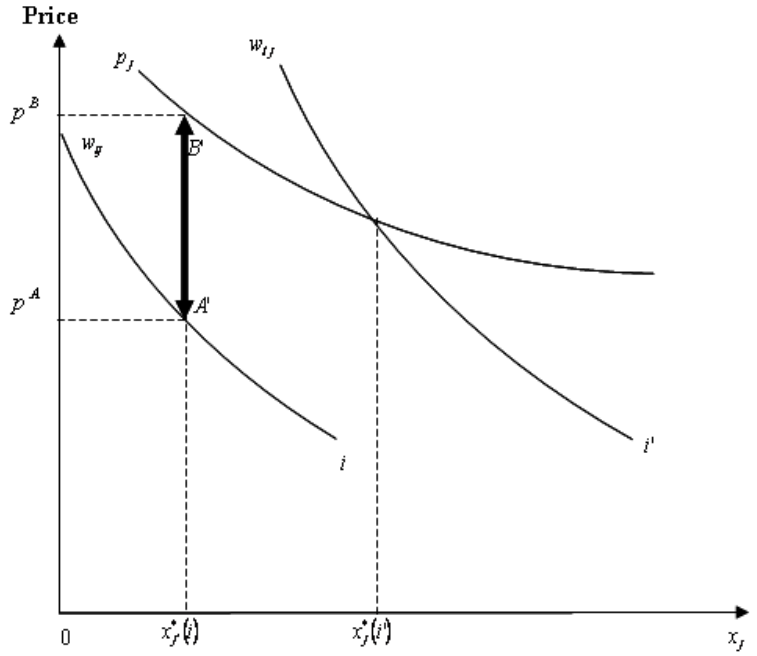


Figure 4.

c) The segmentation of the market

According to Freeman (1992) and Straszheim, 1974, if market segmentation does exist like in Cameroon, separate hedonic price functions must be estimated for each segment; and imported chicken and local flesh chicken must be separately estimated for each segment with a different set of implicit prices.

2.3. Hedonic regression

Awono et al (2008), show that the market perhaps considered as segmented. In fact, between the flesh local chicken and the imported chicken, there are many place of sale (big traditional markets, outskirts markets, "fish shops"[3], small quarter shop) and scale of price (by judged, in kilogram or in separated part).

It is important to underline that acquired results (section 3) can not compared with others; for lack of similar studies in African markets. However, in he is article on consumer's preferences for the sheep and nanny goats in the south of Nigeria, Jabbar (1998) considers in its hedonic regression, price as dependent variable. He splits independent variables into two groups: on the one hand it considers ordinal variables to be co variables, numerical variables (the weight of the animals and the length of animal husbandry) and as mailmen, (sex, market, reason of sale). But as part of our study, it was difficult to implement the method of analysis of covariance (ANCOVA) used by Jabbar (read Gudajarati, on 2003) to determine the hedonic price of the chicken; for lack of covariables (we didn't measure weight and length of animal husbandry of the bought chicken). In so far, we did not insert in our model the weight of the chicken, which however participates unquestionably in the determination of the selling price. Unfortunately, it is not possible to know the weight of the chicken for every transaction, this last being principally sold by judged: any try of estimate of weight is perhaps very badly interpreted as well by the seller as even by the consumer. Moreover, the taking into account of the income of consumers would undoubtedly have been a very important explicative variable. But, the most part of the interviewees refused to specify their level of wage and / or remuneration, what restricted us in the simple knowledge of the marginal willingness to pay

[3] Fish shops are special markets where fish and imported frozen cutting chicken are sold and stored in freezer.

for the chicken attributes. This is why we considered the socio-professional category as an explicative variable, this one being linked at the level of remuneration of the interviewee.

Table 1. Explicative variables used to estimate hedonic price function.

Variable	Description
1. Dependent variable	
Willingness to pay [WTP]	WTP of chicken: posted for imported frozen cutting chicken and proposed by the purchaser for alive flesh local chicken sold. The price is expressed in Euro (€).
2. Independents variables	
2.1. Criteria related to the product ✓ Low cost [COST] ✓ Taste [TASTE] ✓ Practice [CUISS]	1 if the choice is determined by the least price of selected chicken and 0 if not. 1 if the choice is determined by the succulence of the flesh of selected chicken and 0 if not. 1 if the practice of the chicken (the fact that it is plucked or cut out) enters the choice of bought chicken and 0 if not.
2.2. Criteria related to the place of sale ✓ Bargaining [BARG] ✓ Handing-over [HOVER] ✓ Proximity [PROX] ✓ Quality [QUALIT]	1 if the choice of the place of sale is determined by the possibility of bargaining and 0 if not. 1 if the choice of the place of sale is determined by the possibility of handing-over and 0 if not. 1 if the choice of the place of sale is determined by its proximity and 0 if not. 1 if the choice of the place of sale is determined by the quality from the products which are there and 0 if not.
2.3. Dependent criteria with the interviewee ✓ Age [AGE] ✓ Mouth [MOUTH] ✓ Principal activity o Unemployed [UNEM] o Informal [INFORM] o Salesmen [SALES] o Employee [EMPLO] ✓ Level of study [LEVET]	Numerical variable which indicate the consumer age. Numerical variable which indicate the size of the household number of mouths to be nourish). 1 if the interviewee is unemployed and 0 if not. 1 if the interviewee qualifies his occupation of abstract and 0 if not. 1 if the interviewee is a salesman/trading and 0 if not. 1 if the interviewee is an employee/civil servant and 0 if not. Ordinal variable indicating the level of study, on a scale from 1 à 4[180]: 1 = not made studies; 2 = primary Studies; 3 = secondary Studies and; 4 =

	Higher education.
2.4. Preference for the local flesh chicken [PREFLOCAL] Instruments of the preference of local flesh chicken: ✓ At the time of ceremonies [PATC] ✓ In households [PATF]	1 si, hors considération de prix, le poulet local est préféré par le consommateur et 0 sinon. 1 if, except consideration of price, the local flesh chicken is preferred by the consumer and 0 if not. 1 if the local flesh chicken is specifically consumed at the time of the particular ceremonies/occasions and 0 if not. 1 if the local flesh chicken is consumed in a usual way in the households and 0 if not.

The linear regression model can therefore be given by:

$$WTP_j = \beta_0 + \sum_{j=1}^{m} \beta_j z_{kj} + \varepsilon_k \quad \text{pour } j = i,\ldots,n\,, \qquad [5]$$

β_j estimates the marginal value of each characteristic.

In this study, the hedonic regression was employed using the method of ordinary least squares (OLS) procedure of Eviews software for windows to estimates parameters.

3. Results

Several models were fitted to assess the effect of different factors on price of chicken attributes.

3.1. Case of the imported frozen cut chicken

The table 2 introduces the results of the hedonic regression for imported frozen cut chicken.

Table2. Results of the hedonic regression for imported frozen cut chicken.

Dependent variable: willingness to pay for imported frozen cut chicken attributes [WTP]				
Included observations: 137				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1296.912	70.50374	18.39493	0.0000
BARG	-26.72336	20.46026	-1.306111	0.1939
PROX	-90.78454	27.84462	-3.260398	0.0014**
HOVER	-43.00616	64.03363	-0.671618	0.5031
COST	137.6835	39.31946	3.501663	0.0006***
PRACT	149.4811	58.70781	2.546188	0.0121*
AGE	-0.046201	0.937739	-0.049269	0.9608
UNEM	-15.56526	31.11292	-0.500283	0.6178
EMPLO	-47.70663	31.28748	-1.524783	0.1298
INFORM	-17.75081	28.80531	-0.616234	0.5389
MOUTH	2.523053	2.660886	0.948200	0.3449
LEVET	-15.40468	13.97696	-1.102148	0.2725
R-squared	0.192523	Mean dependent var		1366.058
Adjusted R-squared	0.121465			
S.E. of regression	103.3870			
Sum squared resid	1336109.			
Log likelihood	-823.5870	F-statistic		2.709387
Durbin-Watson stat	0.192523	Prob(F-statistic)		0.003639

Caption: Significant test, *** significant at 1 % , ** significant at 5 % and significant at *10 %.

Like Jabbar (1997) and Dalton (2004) research on the hedonic prices of rice in West Africa, the significant variables call several interpretations:

- The variable [COST] is statically significant and positive; indicating that consumers are willing to pay imported frozen cut chicken as price is less than other product, such as in our case local flesh chicken..
- Practice for cooking [PRACT] is significant and positive, indicating that consumers are more likely to buy chicken made proportional, sold in parts and therefore ready for cooking dishes.
- Proximity of the place of sale is significant and negative [PROXI], this means that the consent to pay cutting chicken in nearness markets of household is weaker than in the more distant markets. Survey carried out on the field (Awono et *al*, 2008 ; Awono, 2008) in Yaoundé proving that the distance of the markets where chicken are sold, is not a restricting factor for consumer when trying a less expensive chicken.

As regards none significant variables, certain results obtained are a priori against - intuitive. Socioeconomic variables are not significant, indicating those consumers are not willing to pay premium for those perceived attributes. We assumed that, offers have a policy of low cost which attracts consumers despite their principal activity or social category.

3.2. Case of the local flesh chicken

Table 3 has the results of the hedonic regression for local flesh chicken.

Table 3. Results of the hedonic regression from local flesh chicken

Dependent variable: willingness to pay for local flesh chicken [WTP]				
Included observations: 156				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3605.136	559.1027	6.448074	0.0000
MOUTH	8.443824	22.72587	0.371551	0.7108
AGE	6.134856	8.095911	0.757772	0.4499
LEVET	-179.2956	126.1968	-1.420761	0.1576
TASTE	-169.8975	299.3850	-0.567488	0.5713
QUALIT	-203.0100	326.7333	-0.621332	0.5354
PROX	-180.9171	263.3542	-0.686973	0.4932
BARG	393.5863	186.6845	2.108296	0.0368*
HOVER	117.4038	465.8474	0.252022	0.8014
UNEM	45.06590	206.1019	0.218658	0.8272
EMPLO	-267.7879	202.8124	-1.320373	0.1888
SALES	-137.1425	239.1956	-0.573349	0.5673
PREFLOCAL	78.10300	171.4738	0.455481	0.6495
PATC	-287.0493	178.1894	-1.610922	0.1094
PATF	-49.74685	245.8415	-0.202353	0.8399
R-squared	0.125690	Mean dependent var		3363.462
Adjusted R-squared	0.038879			
S.E. of regression	940.6050			
Sum squared resid	1.25E+08			
Log likelihood	-1281.527	F-statistic		1.447862
Durbin-Watson stat	1.541883	Prob(F-statistic)		0.138927

Caption: Significant test, * significant at 10 %

The only variable which is significant is possibility of negotiation [BARG]. But it is negative, which confirms that to have a price near to his spare price, the consumer tries to negotiate

price with the seller. So the willingness to pay for the local flesh chicken is not only dictated by the peculiarity of the chicken, but also by other tacit attributes.
Like in 3.1, socioeconomics variables are significant. We can conclude like in 3.1.

4. Conclusion and implications

This study aims at developing an implicit price of chicken in Cameroon on the basis of the extrinsic and intrinsic characteristics of chicken as it is perceived by the consumer. The main originality of this approach is to consider imperfections of Cameroonian market to interpret our results: so, we assumed the segmentation of markets and the consumer never has the perfect information concerning the characteristics of chicken sold.
An essential limit of this study is to have not been able of knowing, for every transaction, the weight of the bought local flesh chicken, whereas this element indeed constitutes a major determinant of negotiated price.
However, econometric estimations confirmed that the weak marginal willingness to pay the local flesh chicken is due the very weak purchasing power of consumers. Consumer's substituted local flesh chicken by imported frozen chicken. This advantage of the imported frozen chicken compared to the local flesh chicken is reinforced by their practice in culinary usage and availability in local market. The only advantage of local flesh chicken which is sold alive, is the possibility of bargaining
Perhaps that, a better valorisation of the local flesh chicken attributes by improving information to the consumers could contribute to follow-up the local chicken connection. In the same way, they could wonder about the opportunity of the adaptation of local chicken connection to the evolution of household habits: allowing presented the local flesh chicken in separate parts and in all markets. Finally, the reduction of the price difference between the local flesh chicken and the imported chicken could envisage via a strengthening of protection on importation borders. The opportunity of such measures, its effects on the global economic and its compatibility with commitments of Cameroon with World trade organisation and International monetary fund remain to be studied and make subject of ongoing researches.

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