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Disruption on urban chicken markets in Haiti and Cameroon: The role of socio-economic factors on chicken's consumption

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Abstract:

Since the beginning of 2000s, imports of frozen pieces of chicken from the European Union or America have considerably increased in several African and Caribbean developing countries, competing with local chicken meat. This evolution has contributed to a complete transformation of urban consumption habits as regards poultry meat. Investigations have been done in 2005 in Yaoundé (Cameroon) and in 2006 at Port-au-Prince (Haiti) applied to 180 urban households in each country, showing that imported frozen pieces of chicken have widely substituted for the local chicken which has already quite disappeared in Port-au-Prince, but is still appreciated by Yaoundé consumers. This article aims to assess the impacts, on such an evolution of i) socio-economic features of consumers and ii) the impact of chicken consumption habits, for what imported *versus* domestic chicken may be more or less adapted. In order to take into account numerous qualitative variables, econometric regressions are using synthetic continue variables built on multiple correspondence analysis of qualitative variables. Results differ from Port-au-Prince to Yaoundé.

Perturbations des marchés urbains de viande de poulet Haïtien et Camerounais : Influence des facteurs socio-économiques sur la consommation de poulet

Résumé:

Depuis le début des années 2000, les importations de volaille congelée en provenance d'Europe et d'Amérique se sont considérablement développées dans plusieurs pays en développement d'Afrique et des Caraïbe, concurrençant les productions locales de poulet. Cette évolution s'est traduite par une mutation des habitudes de consommation de viande de poulet en milieu urbain. Des enquêtes, menées en 2005 à Yaoundé (Cameroun) puis en 2006 à Port au Prince (Haïti), auprès de 180 ménages urbains chaque pays, ont montré que les découpes importées de poulet congelé se sont largement substituées au poulet local. Ce dernier a presque disparu à Port-au-Prince, mais reste apprécié des consommateurs à Yaoundé. Cet article vise à mettre en évidence les déterminants de cette évolution en évaluant d'une part le rôle joué par la situation socio-économiques des ménages urbains, et d'autre part le rôle joué par les modes de consommation de poulet impact, auxquels les différents produits sur les marchés sont plus ou moins bien adaptés. De façon à prendre en compte les très nombreuses variables qualitatives, les régressions économétriques utilisent des variables synthétiques continues construites sur la base d'analyse des correspondances multiples. Les résultats obtenus diffèrent sensiblement d'une zone enquêtée à l'autre.

Key words: Chicken, urban consumption, developing countries, household's characteristics, Cameroon, Haiti.

JEL classifications: Q18 (Agricultural Policy, Food Policy), Q17 (Agriculture in international Trade), D 12 (Consumer Economics: Empirical Analysis)

Remerciements *: Nous remercions Pierre Dupraz (UMR SMART 1302 Agrocampus Ouest – INRA) qui nous a suggéré l'idée de construire des variables synthétiques permettant une prise en compte cohérente, dans nos régressions, des nombreuses variables quantitatives.*

Disruption on urban chicken markets in Haiti and Cameroon:
The role of socio-economic factors on chicken's consumption

1. Introduction

During spring 2008, several developing countries have known riots related to food prices increase on international markets -rice and other cereals, but also sugar and meat (FAO, 2008a, 2008b, 2008c). Food riots left forty dead in February 2008 in Cameroon (Yaoundé, Douala) and killed at least five people in Haïti (Port au Prince) in April 2008. Violent urban protests and demonstrations occurred in many countries in Africa, Asia and Latin America. That crisis reminds that food security is not achieved everywhere, and reopens the debate about food dependence of developing countries on imports, which raises problems in case of world prices surge. That issue is not new. Cheyns and Bricas (2003) show that, to insure cities food security, the urbanization speeding-up in poor countries is accompanied by the growth of food imports from international markets, which actually competes with local production, even if that trend has repercussions on eating patterns and gives the opportunity for agricultural areas to capture new urban food markets.

Since the beginning of 2000s, in order to let poor people accede to meat consumption, several African and Caribbean countries have opened their domestic chicken market to foreign imports, by reducing import tariffs. Thus imported frozen pieces of chicken from the European Union or America compete with local chicken meat, causing the collapse of many poultry husbandry and the loss of many jobs in the local chicken food chain. The aim of this paper is to analyze the competition between domestic and imported poultry meat in developing countries from the demand point of view. We choose to study the cases of Yaoundé (Cameroon) and Port-au-Prince (Haiti). Cameroon and Haiti are both developing countries confronted with recent high increase of chicken imports.

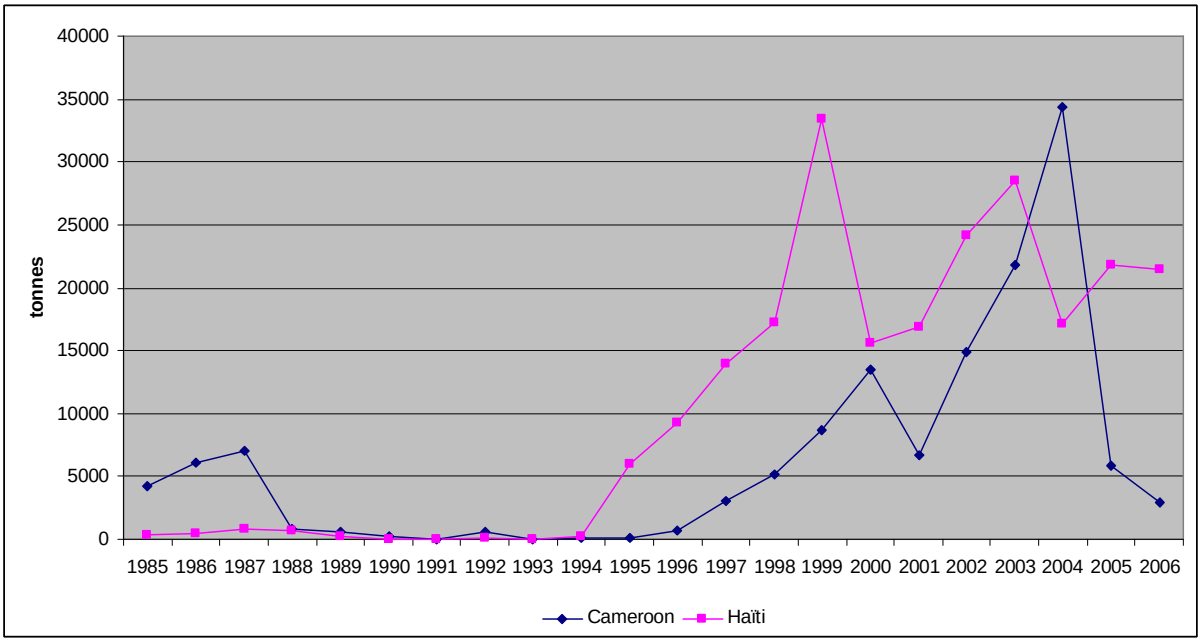
Before 1995, Cameroon ad valorem tariff on chicken imports was 20 %[1]. Since the 1990's, in order to open the market and let poor people to accede to meat consumption, Cameroon, like other African countries, has classified poultry as essentials. Hence, from 1995 and until 2005, corresponding import tariff has been reduced to 5%, other taxes being unchanged (Direction générale des douanes du Cameroun, from Ccima, 2005). During the same period, a large

[1] which value added and phytosanitary taxes add to (17,5 % and 3 % respectively)

liberalization of trade exchanges has occurred in Haiti, in the frame of the implementation of Structural Adjustment Programs. In 1995, the last tariffs reform instituted a simplified system with only six levels of tariffs: 0, 3, 5, 10, 15 and 57.8 % (the last being only applied for gasoline). As a result, import tariffs on agricultural commodities, like poultry meat, decreased from 40-50 % to 15 % or less. Note that the actual Haitian tariff on poultry meat imports (15%) is lower than the WTO bound tariff (20%) (WTO, 2003; WTO, 2006).

Available FAOSTAT data from 1985 to 2006 about poultry meat Haitian and Cameroonian imports show that in both countries the liberalization of chicken import tariff coincides with a large increase of corresponding imported quantities.

Graph 1: Cameroon and Haiti imports of poultry meat, 1985-2006



Source : FAOSTAT

Concerning poultry meat production, because of a lack of consistent national statistics, FAOSTAT only provide estimated and regular figures for Cameroon and Haiti. Those data are in contradiction with NGO's and producer's associations' statements which denounce the competition between domestic and imported chicken (mainly from the European Union or America) and the resulting collapse of many poultry husbandry and the loss of jobs[2] in the local chicken food chain[3]. They notably recommend going back to the previous situation by

[2] The figure of 110 000 rural jobs lost in poultry Cameroon industry, due to import surges, has been given by Acdic (2005) and has been also used by FAO (2006).

[3] see Association civile de défense des intérêts des consommateurs (Acdic), 2005; Chambre de commerce, d'industrie, des mines et de l'artisanat (Ccima), 2005; FAO, 2006 for Cameroon ; Christian Aid, 2006 for Haïti.

reinstituting high level of border tariff protection against imports of chicken pieces. This position is reinforced by the frequent use of export subsidies on American or European chicken supply, which are considered as unfair practices beside domestic chicken production. On the other hand, during the same period, chicken consumption has increased in Haitian and Cameroon populations, leading to move near the recommended level by the World Health Organization en terms of animal protein intakes (Teleu-Ngandeu & Ngatchou, 2006).

In both Cameroon and Haiti, a rapid observation of food markets shows that there are actually three types of chicken supplied to urban consumers (Awono Bessa, 2008):

- Rustic chicken, which is called "Villageois" in Cameroon and "Creole" in Haiti, is produced at family home, in only precarious shelter. In Cameroon, rustic chicken is most often breed in rural areas, and it is sold alive directly to the consumer or via peri-urban markets after being collected at the village. In Haiti, one can find Creole chicken in urban market places. That chicken is especially used for religious (Cameroon) or voodoo (Haiti) ceremonies.
- Local flesh chicken, sometimes called "White chicken" in Haiti, is produced in semi-industrialized farms. Production chain, feeding, sanitary and veterinary following are rationalized, and animals live in permanent structures. It is sold alive at traditional urban markets. That type of chicken has been, for few years, actually very hard to find in Haiti, whereas it still exists in Cameroon.

Rustic and local flesh chickens are essentially sold whole and alive. Consumers have to slaughter and clean it out themselves or pay a supplement for that. In some rare supermarkets in Yaoundé, one can find whole local rationalized flesh chicken sold ready to cook.

- Imported chickens are usually sold frozen and by pieces at traditional urban markets, supermarkets or fish shops which have freezer. One can also find few entire frozen chicken.

Taking the cases of Cameroon and Haiti, this paper aims to assess the respective role, on the evolution of urban households' chicken consumption, of i) socio-economic households' features and ii) chicken consumption habits, for what imported *versus* domestic chicken may be more or less adapted. In particular, we aim to know to what extent imported chicken is considered as substitute to local chicken, or if this new available commodity has actually replaced local chicken in urban households' demand. Do substitutions between domestic and imported commodities implemented by urban consumers differ from Haiti to Cameroon?

Cameroon and Haiti differ by their geographical situation and level of development[4]. Cameroon is an African developing country, member of African-Caribbean-Pacific group. Haiti is located in Caribbean - American area and is classified as one of the last developed countries in the world. Table 1 gives some economic reference data for Cameroon and Haiti. Those differences are interesting because they may impact on consumers' adaptation to the development of frozen chicken cuts imports newly imported products.

Table 1: Economic reference data about Cameroon and Haiti

	Cameroon	Haiti
Average population, (2003-2005)	17.408 millions	9.150 millions
Urban population share in 2007	56 %	40 %
Average annual growth rate of urban population, (1990–2007)	+ 4.6 %	+3.8 %
GNI per capita (2007)	862 $	560 $
Population share under the poverty line (1.25$ per day), (2007)	33 %	55 %
Number of persons in a condition of undernourishment, (2003-2005)	4.0 millions	5.3 millions
Population share in a condition of undernourishment, (2003-2005)	23 %	58 %
Intensity of food deprivation (1)	230 kcal	430 kcal (2)
Capital of the country and population	Yaoundé 1.2 million	Port-au-Prince 3.8 million

(1) "The intensity of food deprivation indicates how much food-deprived people falls short of minimum food needs in terms of dietary energy. It is measured as the difference between the minimum dietary energy and the average dietary energy intake of the undernourished population (food-deprived). The intensity of food deprivation is low when it is less than 200 kilocalories per person per day and high when it is higher than 300 kilocalories per person per day. The greater the food deficit, the greater the susceptibility for health risks related to under nutrition" (FAO calculations).

(2) That is the highest score in the world

Sources: FAO website ; CNUCED, 2008 ; World Bank website; UNICEF Website

In order to examine the determinants of food consumption, standard models of household consumption decisions, proposed by Samuelson (1956), or the implementation of Almost Ideal Demand System (AIDS) models are usually used because they are perfectly suited for making projections in terms of changes in households consumption expenditures. The standard household and AIDS models have been applied partially to Sub-Saharan countries by Strauss (1982), Tsegai and Kormawa (2002), Kone (2002), Simister and Piesse (2002) and Ruel et al. (2005). But they require complete data, dealing with price, consumption and supply quantities, and household budget, collected annually on the basis of consumption

[4] Besides, both countries have not been concerned by the avian pest during the period of study.

budget investigations. If such approaches are possible in developed countries, where consumption budget surveys are done every year, one can state that, except in South Africa (Simister and Piesse, 2002) and maybe other rare countries, there is a wide scarcity of reliable information about food consumption in Africa and the Caribbean, because of a total lack of statistical opinion polls. Those that exist are often outdated: for example the last corresponding data have been collected in 1999 in Haiti (IHSI, 2008) and in 2001 in Cameroon (NIS, 2008), and results have been available only four to five years later, rendering ineffective decision-making and projections obtained in most developing countries.

Recent studies in developing countries have implemented small and *ad hoc* surveys, taking into account the dynamic development of demand such as recent evolution of eating habits. For example Dury et al. (2002) or East et al. (2005) use temporal data collected on households and market and restaurant customers to understand factors influencing urban consumption. The main study about meat consumption was done by East and al. (2005) to understand the determinants of urban bush meat consumption in Rio Muni (Equatorial Guinea). East and al (2005) use interviews with 100 consumers in households and 37 restaurants customers. They show that Guinean consumers have a strong preference for fresh meat and fish over frozen products, but for price considerations they most often eat frozen foods. The degree to which meat consumers are able to satisfy their preferences is significantly related to their income. Frozen produce is considered as an inferior good, with negative income elasticity, while fresh produce, including bush meat, is a normal good.

Our study follows the same logic as that of East et al. (2005). We consider urban chicken consumption in a context of crisis in poultry food chain linked with the development of chicken imports. A first innovation in our research is to carry out a comparison Cameroon in Africa and Haiti in the Caribbean. Both are developing countries which apparently face the same situation: imported chicken compete with declining local chicken production. We aim to analyze if this common evolution leads to similar results in terms of urban consumer's habits in the two countries, in order to predict the likely future trends in chicken consumption and suggest potential differentiated policy responses for each country.

Two similar investigations of eight weeks have been done successively in Yaoundé (Cameroon) and Port-au-Prince (Haiti). Representative sample of urban households have been polled about their chicken consumption: essentially qualitative data about preferences, habits and willingness to pay for chicken meat, but also socio-economic households' features have been collected. To deal with the numerous qualitative collected variables, a second innovation

in that paper lies in the method we adopt: econometric regressions use synthetic continue variables built on multiple correspondence analyses of qualitative variables.

The second section of the paper presents the survey and its preliminary descriptive statistical analysis. The third section presents the method used to implement regressions and their main results. The last section concludes, focusing on the perspectives, for local chicken, to restore their previous urban consumption share, respectively in Cameroon and in Haiti.

2. The household survey

2.1. Survey description[5]

In order to identify the relevant determinants of chicken consumption for consumers, a specific survey was conducted during May-July 2005 in Yaoundé, and during June-August 2006 in Port-au-Prince. After a first examination of urban chicken meat trade (types of chicken and associated markets), a formal questionnaire related to the evolution of urban consumption was implemented to a sample of 180 urban households in each country. The Port-au-Prince survey has been lightly modified compared to the Yaoundé's one in order to take into account failing that had been identified during the work in Cameroon.

To ensure a representative sample, the quota method has been applied (like Dury et al., 2002): the allocation of several control variables (or criteria) is similar in the sample to the distribution in the global population. Control criteria apparently have no particular relationship with chicken consumption; their use aims at minimizing the risk of ignoring some parts of populations in our sample. For household pool, control variables were household size and types of housing (equipment and infrastructures available). Available statistics about their distribution in the global population have been taken from IHSI (2003), ECAM (2000) and INS (1994). In the same logic, to minimize distortion in collected data, the localization of each inquiry had been decided beforehand on a map, with respect to demographic weight of the sites of investigations and/or places of consumption.

Examples of using control variables to implement the quota method are presented in appendix 1[6]. The survey questionnaires are available from the authors upon request.

Boxes 1 and 2 briefly present Yaoundé and Port-au-Prince.

[5] Data used in this article have been collected by Cyprien Awono B., in the frame of his PhD studies (Awono Bessa C, 2008).

[6] Note that Haitian survey has been made in a very difficult context of urban violence and high level of insecurity: the respects of statistic quotas of polled people actually constituted a real challenge.

Box 1: Yaoundé (Cameroon)

Yaoundé, also called "the city of seven hills", has been the administrative and political capital of Cameroon since 1922. After Douala, which is considered as the economical capital, Yaoundé constitutes the second biggest city of Cameroon, and is the county town of Mfoundi Department and of Centre Province. Historically, Yaoundé is composed by four districts.

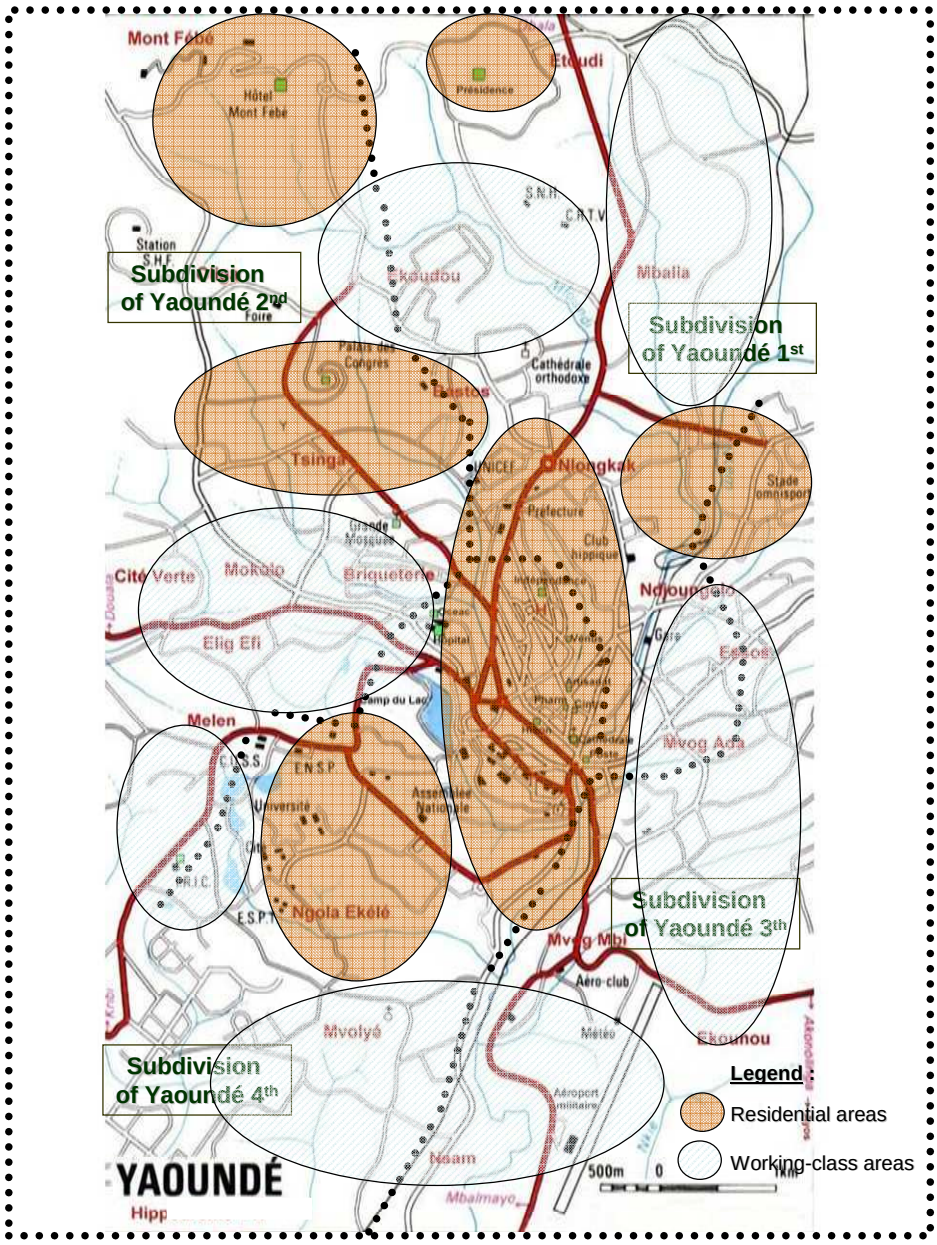
Yaoundé 1st, 490 000 inhabitants in 2001, is in the north of Yaoundé. That is the headquarters of the Presidency of the Republic and of the province. It is composed by both popular areas (*Etoudi, Nlongkak, Mvog-Ada, Essos*) in the north and residential area (*Bastos*) in the South.

Yaoundé 2nd , 500 000 inhabitants in 2001, is located at the West part of Yaoundé. In the North, *Tsinga* and *Mont-Fébé* are residential areas, but the main part of population live in very popular areas (*Mokolo, Briqueterie, Melen, Nkomkana*).

Yaoundé 3rd, 172 000 inhabitants in 2001, is actually the "old Yaoundé". Located in the centre and South-West of the city, it was the headquarters of German and French authorities. It now houses all public administrations and concentrates major part of shops. Downtown is mainly constituted by buildings and residential areas, whereas the South-West concentrates a large part of population in popular areas (*Mvolyé, Efoulan*).

Yaoundé 4th, 344 000 inhabitants in 2001, is located in the Eastern and South-Eastern part of the capital. There are there several popular areas (*Nsam, Mvog-Mbi, Nkoldongo, Kodengui*), the airport and several agro-industry head offices.

Since 2007, Yaoundé is cut into seven districts. *Yaoundé 5th*, *6th* and *7th* respectively come from the reorganisation of *Youndé 2nd*, *4th* and *1st*.



Source : Awono Bessa (2008), using INS (2005)

Box 2: Port-au-Prince (Haiti)

Port-au-Prince, more than 1.2 millions of inhabitants, is the political, administrative, and economic capital of Haiti. It is also the capital of the West Region and one of the 130 districts of the island. Port-au-Prince district has been cut into four administrative "communes" : *Delmas, Pétion-ville, Carrefour, Port-au-Prince commune*.

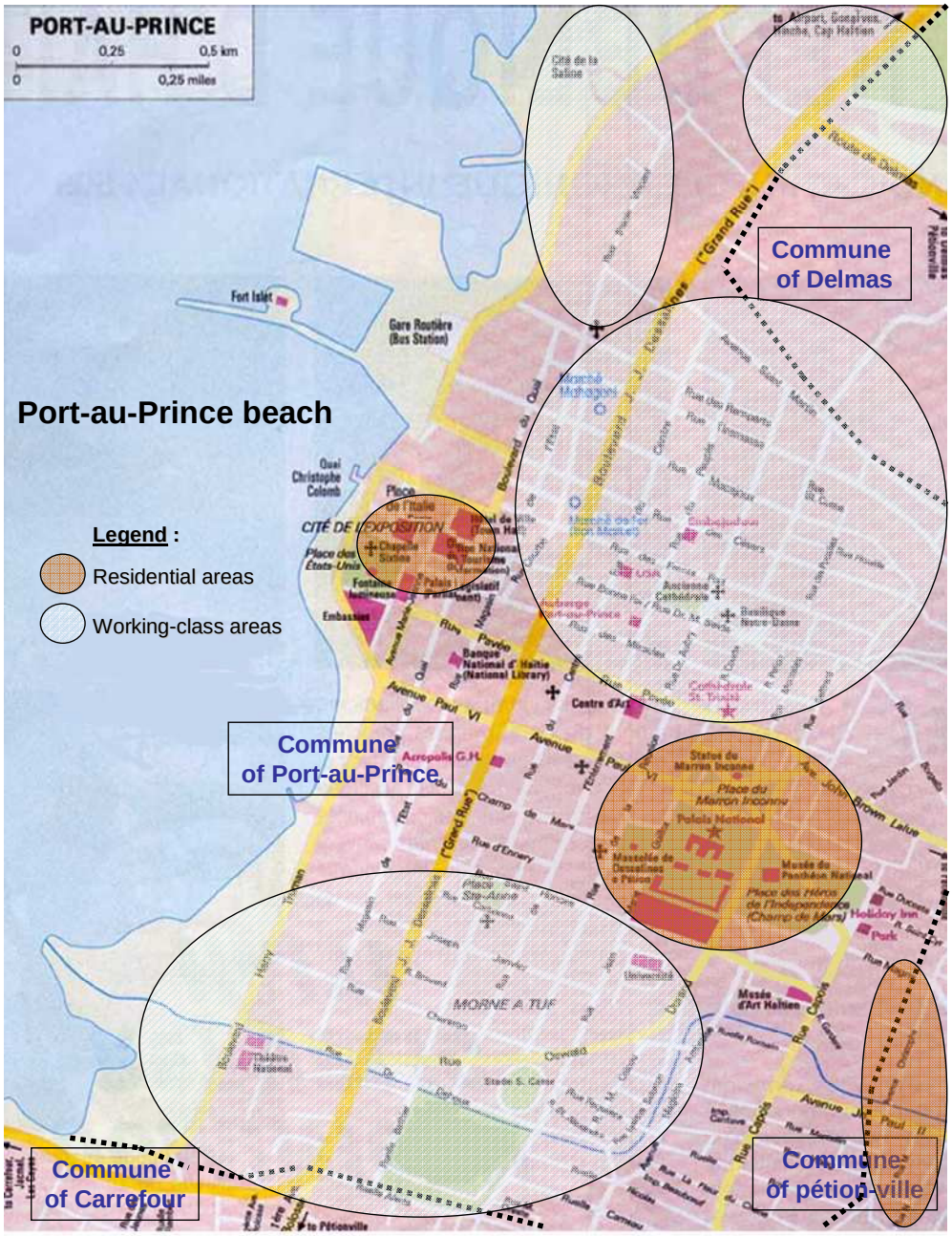
Commune of *Port-au-Prince* is the headquarters of public institutions (Presidency, Ministries and other republican services), universities, cultural centres and museums; that is the "old town". All other communes of Port-au-Prince district actually are suburb areas growing with demographic pressure. The town has been built on many hills and there is like a "positive gradient of richness with the altitude of accommodation".

Port-au-Prince commune is located under little mountains: the Mornes. Except administrative offices, the commune is bordered by several very large shanty towns where there is high level insecurity (*Martissan, Carrefour-Feuille, Cité l'Eternel*).

Pétion ville is at the South suburb of Port-au-Prince, at the top of a hill. This area has been a place of holidays for a long time. It is composed by luxurious villas and constitutes the rich part of the city.

Delmas takes place in the northern part of Port-au-Prince. That is the real industrial heart of the town with the port, the airport, the industrial area and the head offices of many societies and firms. Near to the airport, there are huge shanty towns: *Cité-Soleil* at the West, which actually constitutes a no-rights area, with very high insecurity, and *Maïs-Gâté* in the South.

Carrefour is the more southern commune of Port-au-Prince district. Although it is bordered by shanty towns (*Brochette, Mon Repos*), this part of town is very quiet, and houses many beaches and touristy sites.



Source : Awono Bessa (2008), using ADIH (2008)

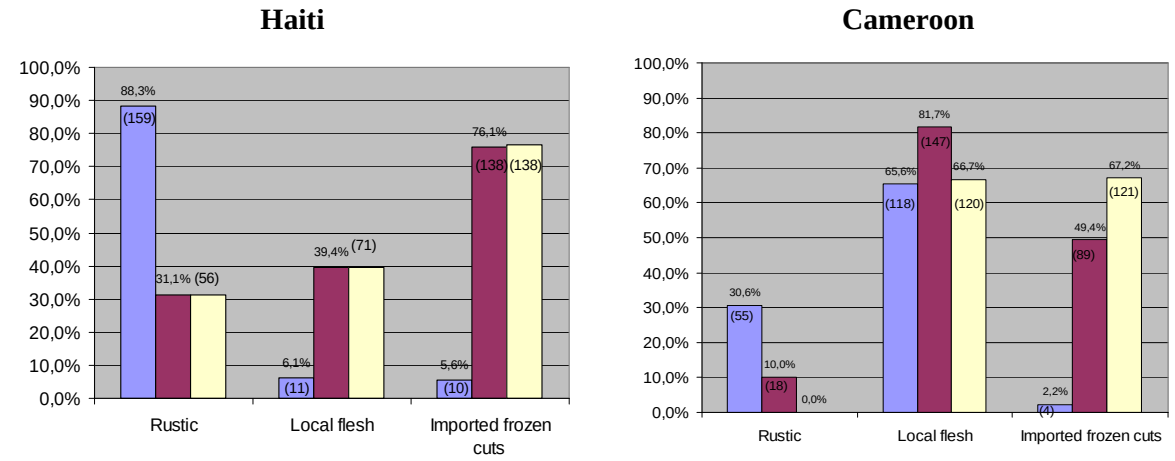
2.2. Preliminary survey results

A preliminary analysis of survey results highlights several interesting issues which would motive developing a more precise econometrical analysis in sections 3.

a- There is a gap between preferences and effective consumption.

Figure 2 presents consumers' preferences relative to types of chicken, out of price matter, and the types of chicken actually bought by households from Port-au-Prince and Yaoundé.

Figure 2. Preferences *versus* actually chicken bought (% of households, 180 households)



Preferred chicken out of price consideration (only one answer)
Chicken actually bought for familial meal (several answers accepted)
Chicken actually bought for ceremonies (several answers accepted)

[Familial meals correspond to usual meals reserved to household's members. Ceremonies design traditional or religious festive meals which brings together several households.]

Source: Household survey. In brackets: total number of answers.

Figure 2 shows the large difference between declared preferences, out of price matter, and the reality of household's consumption. While in both countries, imported frozen cuts are, out of price matter, the less appreciated type of chicken, 49% of Cameroon households say they usually consume them for familial meals and they are 67% for ceremonies meals. Haitian households do not make a difference between familial or ceremonial chicken consumption, and 76 % of households declare they usually consume imported frozen cuts. 82% of households in Yaoundé and 40 % in Port-au-Prince usually consume local flesh chicken; those results are, in each case, bigger than respective scores of local flesh chicken preference (6% and 66 % respectively). Whereas rustic is the preferred chicken for 88% of Haitian households, it is only consumed by 31 %. Only 10% of households usually consume rustic chicken in Cameroon, and especially for familial meals, not for ceremonies, what is less than

the third of the preference outcome (31%). All those results let us think the arrival of imported frozen chicken cuts actually introduced a substitution between types of chicken.

In Port-au-Prince, out of price consideration, the quasi totality (88%) of household does prefer rustic chicken; there is then no sense to analyse socio-economic determinants of such high figure. However the gap between households' preferences and effective consumption is particularly huge in Port-au-Prince, like if imported frozen cuts and local flesh chicken did constitute a second best choice when rustic chicken is not available, and remaining rustic chicken effective consumption seems not to be possible to be replaced.

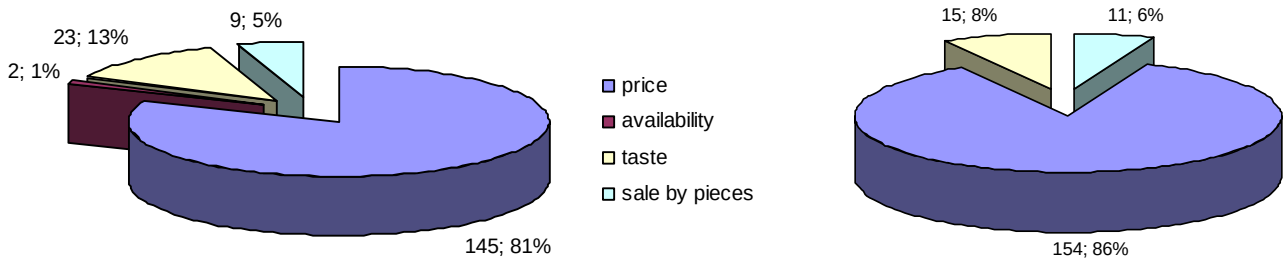
In Yaoundé, households also clearly prefer domestic chicken to imported one (97 % at all) out of price matter, but there is a difference between rustic one and local one (respectively preferred by 31 % and 66 % of households).

In Yaoundé there is a marked difference between usual and ceremonies uses of chicken. While the three types of chicken are consumed for familial meals (with an advantage for local flesh chicken), consumption of imported frozen cuts increases for ceremonies meals to the detriment of both rustic and local flesh chicken: when a large quantity of chicken has to be cooked (like for ceremonies meals), imported frozen cuts are advantageously chosen. On the contrary, for household's meals, domestic chicken (rustic or flesh) continues to be used. It seems that imported frozen cuts constitute an imperfect (but largely used) substitute to local chicken, even if local flesh chicken continues to be largely consumed and appreciated by consumers. For households who prefer rustic chicken, local flesh chicken constitutes an acceptable substitute.

Figure 3 represents the distribution of answers to the question about households' criteria of choosing one type of chicken more than another. Answers to this survey question was free, but we have regrouped all the answers in four headings according to the answer being relative to commodity price, taste, availability, or the fact it was sale by pieces or not. Figure 3 only takes into account the criterion declared in first position to that question (one answer by household).

Figure 3. First criteria of chicken choice declared

Haiti – Port-au-Prince **Cameroon - Yaoundé**



Source: Household survey (180 households)

We can see on the figure that declarations are very similar in Port-au-Prince and Yaoundé: the price is the first criterion of choice, with more than 80 % of answers, before the taste and the sale by pieces. Note that in Yaoundé, the criterion relative to "taste" seems to assume to a patriotism attribute: a lot of households have declared "*I would prefer the local chicken because it is locally produced, anyway it is better*". Issue of availability is very rarely questioned in the survey, and only in Yaoundé.

Furthermore several households polled in Yaoundé mentioned a traditional chicken sharing out, coming from forest people, which certainly participates to maintain the entire local flesh chicken on tables at family meals in Cameroon. Gizzard, heart, wishbone and foots are given to the householder: it would be particularly very bad felt to offer a chicken without wishbone to a householder. Wings are for young ladies: they have to prepare themselves to fly away getting married later. Chicken legs are due to young boys. At last neck and rump are for housewife who has cooked the meal. Imported chicken, sold by pieces, is inappropriate to that traditional allocation.

Such a tradition has not been met in Haiti where, since 1991, the crisis of local chicken industry has introduced a deficit of supplying urban markets in local flesh chicken (Chancy, 2005). But in the same time, rustic Creole chicken is still usual in Haiti, and is the only chicken appropriate for voodoo ceremonies.

Lots of Haitian polled consumers have declared that buying imported chicken by cuts was a way to eat chicken at low costs, by choosing only the interesting wanted piece. Moreover, the

use of common familial meals seems to decrease via the development of a new form of individual home outside fast food for lunch but also for dinner[7].

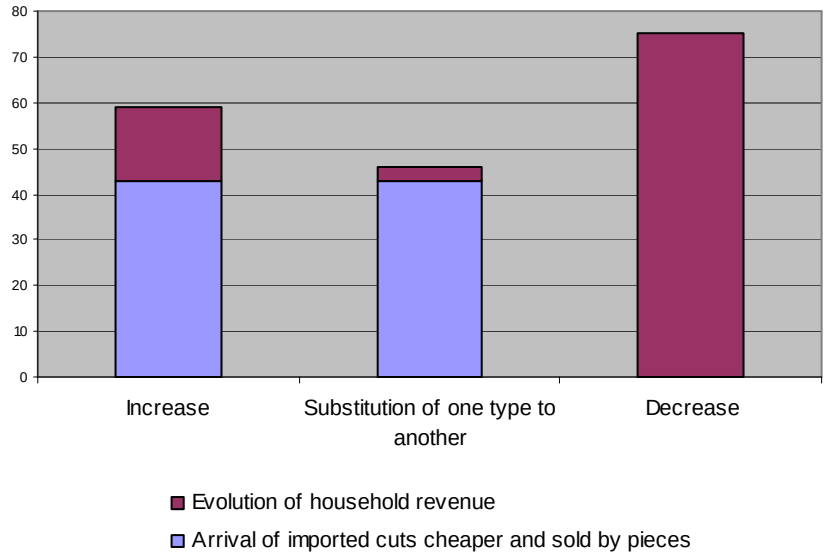
b- Recent evolution of chicken consumption

Several consumers polled in Yaoundé, and a lot of consumers in Port-au-Prince, have declared that chicken was one of the most appreciated foods. Most people have insisted to explain that supplying cooked chicken pieces to hosts is very important to give good impression. Furthermore, for polled households in Port-au-Prince, cheap imported frozen cuts actually give the possibility to Haitian households to supply meat to the entire family.

Chicken is considered as an accessible substitute commodity to other expensive meat. A look at meat prices in Haitian markets, and Chancy (2005) confirm that chicken meat is the cheapest one. However we don't know any precise study which would give elements to measure to what extent the increasing of chicken consumption may affect other meat consumption, or makes global meat consumption growing by giving the possibility to poor household to buy meat.

Figures 4 and 5 present the evolution of chicken consumption habits households have declared in Yaoundé (figure 4) and Port-au-Prince (figure 5).

Figure 4. Evolution of chicken consumption in the five last years in Yaoundé



Source: Household survey (180 households)

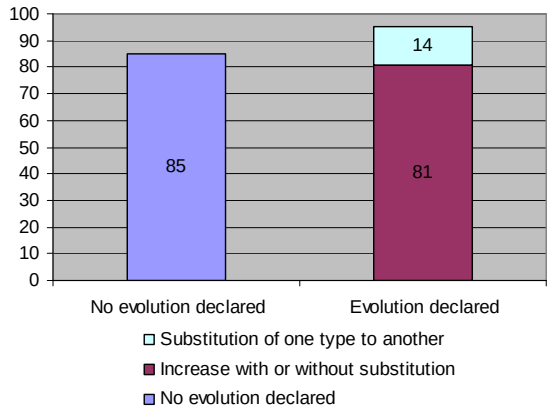
[7] Home out chicken consumption has also been analysed *via* another ad hoc survey in Yaoundé and Port-au-Prince; the presentation of their detailed results will be the core of a further paper.

In Yaoundé, chicken consumption has globally increased for one third of households, decreased for 42% ; 25 % of households left declared they just have changed the type of chicken they use to buy for the five last years. Recent (negative) evolution of household revenue is the raison presented in case of decreasing chicken consumption while in case of increasing consumption, (positive) evolution of household consumption explains only 27 % of answers, the 73 % left being justified by arrival of imported cuts cheaper and / or sold by pieces. The substitution of one type of chicken to another is mainly explained by arrival of imported cuts; only 7 % of households put forward a revenue argument.

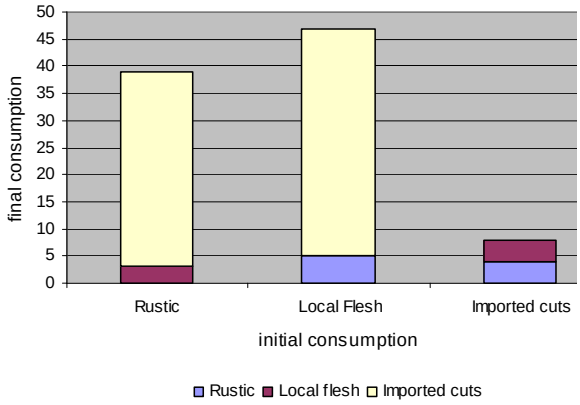
Answers are more detailed for Port-au-Prince because the Haitian survey had been completed after the experiment of Cameroon survey in order to get more precise information especially about substitution among chicken types at least at Port-au-Prince.

Figure 5. Evolution of chicken consumption in the five last years in Port-au-Prince

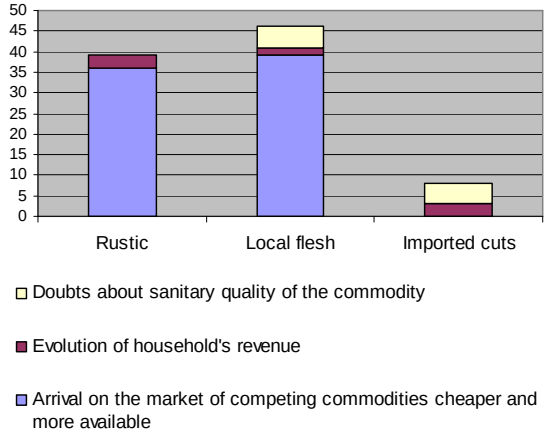
a-Type of evolution declared



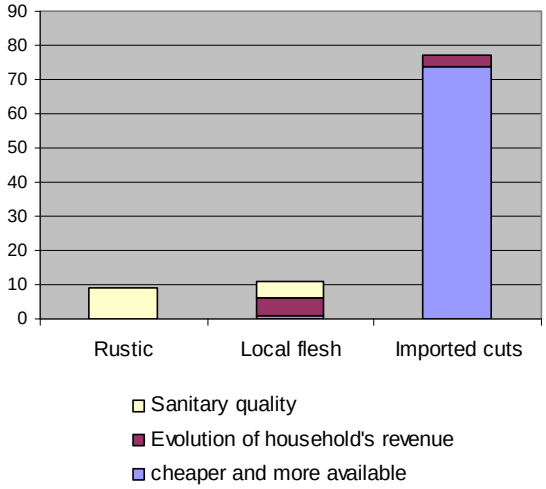
b-Nature of substitution



c- Reasons for giving up…



d- Reasons for adopting…



Source: Household survey (180 households)

In Port-au-Prince 47 % of households declared they had not changed their chicken consumption habits for the five last years. They were 45 % to declare they have increased their chicken consumption (with or without substitution) and only 8 % to say they just have substituted one type of chicken to another. Supplementary questions to Haitian survey give precisions relative to the nature of chicken substitution that occurred in Port-au-Prince. Households were questioned about the type of chicken they did consume five years ago that has been replaced by another type of chicken. One can see the corresponding answers on figure 5b: rustic and local flesh chicken has massively been replaced by imported chicken cuts. There has been little substitution between rustic and local flesh chicken.

Reasons for giving up *versus* adopting each type of chicken have been systematically answered through Port-au-Prince survey, and results have been reported on figure 5c. As expected, rustic and local flesh chicken have been given up for adopting imported cuts essentially because domestic chicken production could not compete with newly imported frozen cuts which are cheaper and widely available, household's revenue evolution accounts very marginally. Imported frozen chicken is sold by cuts; it gives to households the possibility only a piece of chicken instead of only whole chicken, improving then the animal protein availability to poorest households. However 6 % of households declared they recently have given up local flesh chicken or imported chicken cuts and replaced those commodities by rustic and/or local flesh because of doubts about sanitary quality of the initial commodity. It would be interesting to analyse the socio-economical and geographical distribution of those atypical answers.

c- Reserve prices differs among chicken types

Reserve prices have been measured via the answers to following survey question: "What is the price from which you think the chicken is too expensive?" Table 2 compares average households consumers reserve prices for each type of chicken. In coherence with common use, prices for imported frozen cuts are given in kilograms, and those for rustic and flesh chicken are given for a whole chicken (we therefore don't know exactly their weight). Prices are given in local currencies: *Franc CFA* in Yaoundé, *Gourdes* in Port-au-Prince, and converted in US $, 2005.

Table 2. Reserve prices for each type of chicken as presented on urban markets

Types of chicken	Average reserve prices	
	Haiti	Cameroon
Rustic (alive and entire)	**348** gourdes (109) – 118 [9,41 US$]	**3 532** FCFA (905) – 47 [6,82 US$]
Local flesh (alive and entire)	**248** gourdes (94) – 99 [6,70 US$]	**3 363** FCFA (964) – 155 [6,49 US$]
Imported frozen cuts (kg)	**69** gourdes (36) – 158 [1,86 US$]	**1 369** FCFA (111) – 142 [2,64 US$]

In brackets: standard deviation; in square brackets: number of answers.

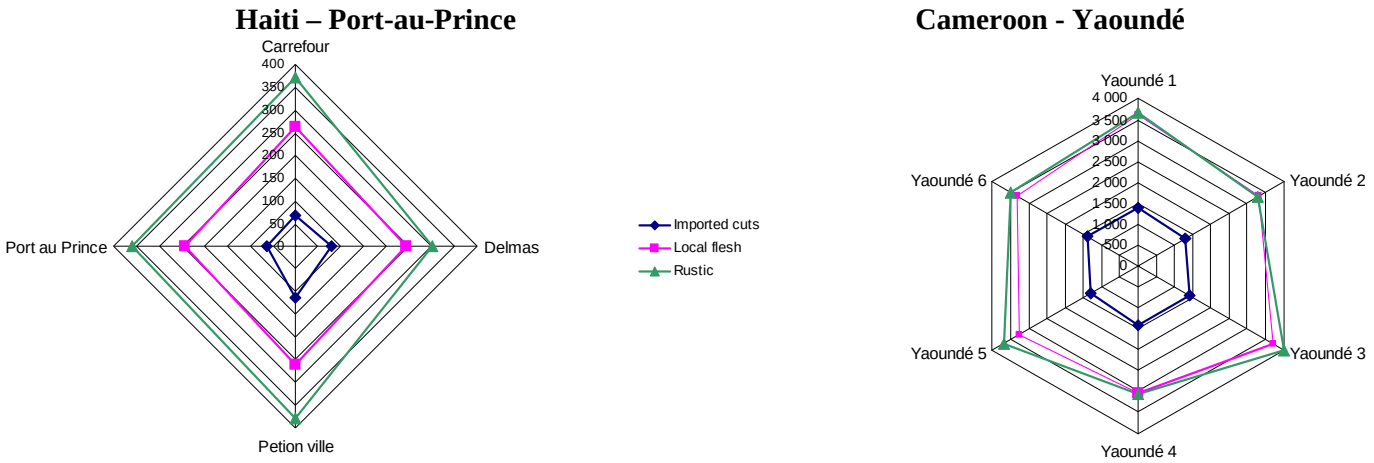
In 2005, 1 US$ = 37 Gourdes, = 518 F CFA.

Source: Average of household survey results.

Prices order are quite similar in Cameroon and Haiti: a kilogram of imported frozen cuts is highly cheaper than any domestic chicken, and rustic chicken is sensibly more expensive than local flesh chicken. But while in Port-au-Prince, willingness to pay for local flesh chicken is clearly lower than for rustic chicken, in Yaoundé the difference between both prices is very small. Such results are consistent with the idea that local flesh chicken constitutes in Yaoundé a relative good substitute for rustic chicken, whereas it is not exactly adapted to the same use as rustic chicken in Port-au-Prince.

Figure 6 brings to the fore the influence of household localisation (quarters in Yaoundé, communes in Port-au-Prince) on willingness to pay the chicken.

Figure 6. Influence of household's locality on average reserve price for chicken



Source: Household survey results.

In Yaoundé, difference between willingness to pay for local flesh or rustic chicken is marked in only three quarters: Yaoundé 3, 5 and 6. Elsewhere there is no significant difference. In

Port-au-Prince like in Yaoundé, one can suppose that chicken sellers adapt trade negotiations with consumers accordingly with differentiated purchasing power between communes. Average highest prices have been declared by households living in Pétion-Ville, the richest commune of Port-au-Prince, and especially for rustic chicken and imported cuts. Differences of declared prices between others communes' households are not so marked. This result has to be confirmed by assessing the role of household's level of life in the establishment of household's reserve price.

The arrival of frozen imported chicken seems to have widely modified consumers' habits. This form of chicken meat is clearly cheaper than domestic (local or rustic) chicken. Preliminary analysis of survey results seems to show socio-economic household's feature have effect on recent evolution of chicken consumption. But frozen imported chicken is also sale by cuts. Cuts are easy to use, and may be particularly well adapted to urban ways of cooking the chicken. At the opposite, the use of locally produced chicken seems to stay in Yaoundé in links with traditional practices of sharing the different chicken parts during familial meals, or regards to a preference of local chicken. It seems also that some rare particular mode of cooking (fumed, roasted) most often use entire chicken. In Port-au-Prince, entire rustic chicken is required for voodoo practices. The question is: to what extent the recent evolution of chicken consumption is related to households' level of life or linked to household's forms of consuming the chicken? In other words, do new facts concern all households at the same level or are chicken consumption new features distributed in function of consumers' level of life?

Following section aims to measure the impact of urban households' socio-economic and forms of consuming features on their effective choice between imported, local or rustic chicken, their willingness to pay each type of chicken.

3. The impact of level of life on chicken consumption features

3.1. The statistical use of qualitative variables

Variables we try to explain are presented in table 3. Tables 4, 5 and 6 present available explicative variables available for each household.

Table 3. Explained variables from household's and home out consumers' surveys

Preference regards to chicken type		
Pref	**1** : Rustic; **2**: Local flesh; **3**: Imported frozen cuts	1, 2 or 3
Actual consumption		
Consomen	Type of chicken usually consumed, first enounced (one answer only)	1, 2 or 3
Consofet	Type of chicken bought for festive meals (one answer only -Yaoundé only)	1, 2 or 3
	1 : Rustic; **2**: Local flesh; **3**: Imported frozen cuts	
Loc	All usual chicken types (several answers possible) – Local flesh	0/1
Rus	All usual chicken types (several answers possible) – Rustic	0/1
Imp	All usual chicken types (several answers possible) – Imported frozen cuts	0/1
Reserve price		
Pmax Rus	Reserve price of rustic chicken	Value per chicken
Pmax Loc	Reserve price of local flesh chicken	Value per chicken
Pmax Imp	Reserve price of imported frozen cuts	Value per kg
		Units : F CFA in Yaoundé, gourdes in Port-au-Prince

Explicative variables about households and consumers level of life or consumption habits are numerous and essentially qualitative; that leads to problems of multi-co linearity in econometrical regressions. To deal with, we combine, in this article, models of regression with statistical analysis of multiple correspondences (AMC). Such a combination has been successfully implemented in comparable cases where numerous qualitative variables are used to build, using AMC, new synthetic continue variables, that can be used in econometric regressions in a Logit model. For an explanation of the method, see for example Ducos et al.(2009) p.679, in the case of identifying the determinants of adopting agro-environmental practices.

In our article, AMC has been implemented to three disjointed groups of qualitative variables - a first group dealing with conditions of life of households (table 4), a second group dealing with socio-economic status of households (table 5), a third one dealing with households' chicken consumption habits (table 6), in order to build three corresponding synthesis variables. Table 7 presents other available variables used in further regressions.

Table 4. Available explicative variables relative to households' conditions of life

House equipment		
wat	Water equipment in the house	0/1
elec	Electricity equipment in the house	0/1
Quarter where household is located		
Quarter	**Del** (Delmas), **Pap** (Port-au-Prince), **PV** (Pétion-ville), **Car** Carrefour - **Y1** :Yaoundé 1, …**Y3** :Yaoundé 6	Port-au-Prince :Del, Pap, PV, Carr Yaoundé : Y1, …, Y6

Table 5. Available explicative variables relative to households' socio-economic status

Study level of people answering		
Stud	**No:** No scolar education, **Prim:** Primary education, **Sec:** Secondary education, **Univ:** Higher education	No, Prim, Sec, Univ
Major professional activity of people answering		
Prof	**Unemp:** unemployed, **Inf:** Activities relative to informal sector, **Com:** Tradesman, **SF:** Employee or civil servant	Unemp, Inf, Com, SF

Table 6. Available explicative variables relative to households' features of chicken consumption

Type of cooking (for Yaoundé : only for festive meals) – Several answers possible		
Sau	Chicken sauce (casserole or called "braisé" at Yaoundé)	0/1
Fum	Fumed (called "boucané" at Port-au-Prince)	0/1
Fri	Fried	0/1
Roa	Roast (in a cooker or roaster) (for Yaoundé only)	0/1
Gri	Grilled (barbecue) (for Yaoundé only)	0/1
Cut or not cut before cooked? (for Port-au-Prince only)		
C	Cooked after being cut (associated to Sau, Fum or Fri)	0/1
W	Cooked as a whole (associated to Sau, Fum or Fri)	0/1
I	Indifferent (associated to Sau, Fum or Fri)	0/1

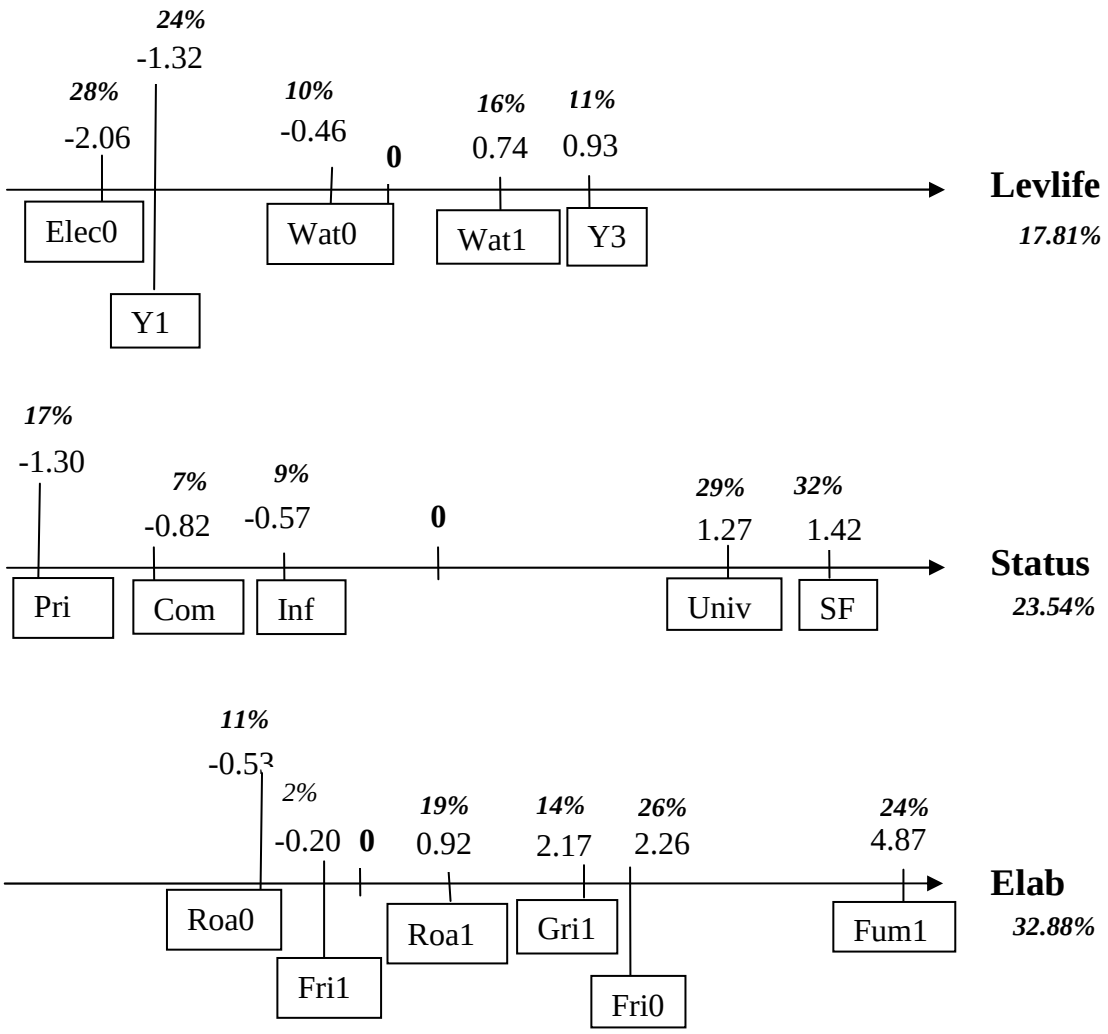
Table 7. Other available variables relative to households

Nb	Number of people composing the household	value
Age	Age of people answering	value
Type of household		
	HC: Men centred, **FC:** Woman centred, **N:** Nuclear	HC, FC, N
Usual chicken buying place		
Mk	Traditional urban market	0/1
Road	Seller on the road	0/1
Smk	Supermarket	0/1
Farm	Farm (for Yaoundé only)	0/1
Pmk	Peri urban market (for Yaoundé only)	0/1

3.2. AMC results

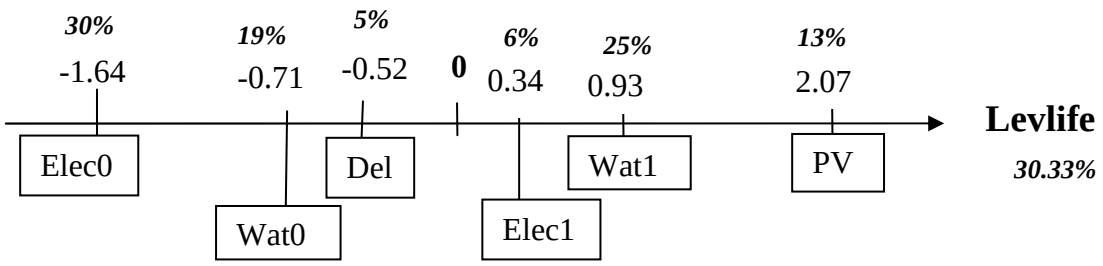
AMC implemented to available explicative variables relative to Yaoundé households' conditions of life (table 4) identifies a dimension explaining 17.81 % of all available variables. We call it "LevLife". In the same way, AMC implemented to Yaoundé households' socio-economic variables (table 5) and households' chicken consumption features (table 6) identify "Status" and "Elab" explaining respectively 23.54 % and 32.88 % of explaining variables. Levlife, Status and Elab are continue scales giving, for each household, its individual position in terms of level of life, socio-economic status and level of elaboration of cooked chicken. Figure 7 gives position and contribution of significant (> 2%) explicative variable for the three new built synthetic variables.

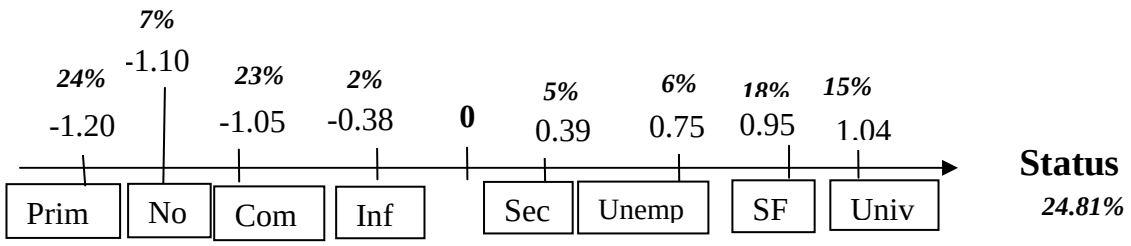
Figure 7. Position and contribution of significant explicative variable in LevLife, Status and Elab - Yaoundé

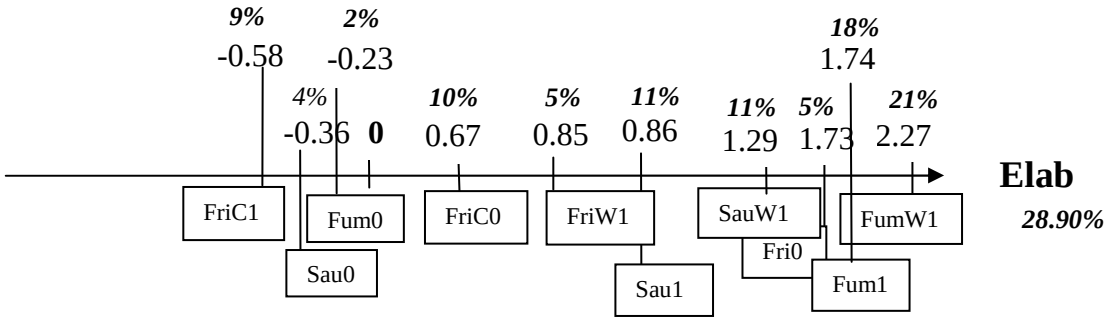


Similar AMC has been implemented for Port-au-Prince. Results are represented in figure 8.

Figure 8. Position and contribution of significant explicative variable in LevLife, Status and Elab – Port-au-Prince







LevLife, Status and Elab now may be used as continue variables in Logit model.

3.3. Regression model

A Logit model has been implemented to explain preferences, effective consumption and reserve prices, using LevLife, Status, Elab and other available variables designed in table 7. Note that variables relative to usual buying places are correlated to choice of chicken type, that's why they only have been taken into account for regression about reserve prices, not for preferences and effective consumption. The built synthetic variables LevLife and Elab are not correlated at all. We used type of the household to explain chicken consumption. Households with man centred are the reference in the following estimation.

a) Preferences and effective consumption

Logit model does not give any significant result for Preferences, in consistence with the observation quite all consumer actually do prefer local chicken in Yaoundé, and rustic chicken in Port-au-Prince (cf. figure 2). Table 8a and 8b present results of estimation for the probability to consume rustic or local or imported chicken with a logit model. Coefficient have been estimated with those associated to the rustic one normalized to zero. Table 9 presents results of the logit model estimation for chicken consumption at festive meals.

Table 8. Yaoundé – Determinants of effective household's consumption (first choice)

8a) local chicken (compared to rustic one)

Parameter	Estimate (t-statistics)
C ***	+ 3.13 (4.17)
Nb**	- 0.16 (- 2.14)

LevLife	+ 0.27 (+ 0.93)
Status	+ 0.25 (+ 0.90)
Elab	+ 0.37 (+ 1.05)
FC	+ 1.09 (+ 0.76)
N	- 0.73 (- 0.61)
8b) imported chicken (compared to rustic one)	
C **	+ 2.06 (+ 2.23)
Nb **	- 0.24 (- 2.28)
LevLife **	- 0.81 (- 2.38)
Status	+ 0.35 (+ 1.01)
Elab	- 0.56 (- 0.12)
FC	+ 0.47 (+ 0.57)
N *	- 2.50 (- 1.74)
Number of observations: 180 ; $\rho^2_{MacFadden}$ *= 0,121 ; LR (zero slopes) = 22.25[0.035]*	

*, **, *** indicate statistical significance respectively at 10%, 5%, 1% level

Table 9. Yaoundé – Determinants of effective household's consumption at festive meals (first choice)

Imported chicken (compared to local flesh one)[8]

Parameter	Estimate (t-statistics)
C	+ 0.32 (+ 0.72)
Nb *	- 0.09 (- 1.66)
LevLife	- 0.22 (- 1.30)
Status	- 0.14 (- 0.84)
Elab **	- 0.40 (- 2.07)
FC	- 0.52 (- 1.44)
N *	- 1.16 (- 1.80)
Number of observations: 180 ; $\rho^2_{MacFadden}$ *= 0.062 ; LR (zero slopes)= 11.44 [0.076]*	

*, **, *** indicate statistical significance respectively at 10%, 5%, 1% level

Results of are quite similar for usual (table 8) and festive meals (table 9): LevLife and Elab have negative impact on choosing imported chicken. But note that LevLife is significant for usual meals, and Elab only for festive meals, and not for usual chicken consumption. The type of household defined by nuclear seems to be significant with a negative effect on imported chicken consumption (at festive meals or not) compared to men centred households. The LR tests show that estimated coefficients are jointly significant both for usual and festive consumption. However, the $\rho^2_{MacFadden}$ for the festive and usual consumption model, as a measure of goodness of fit of the regression are rather low. This is surely due to the effect of omitted variables. Important determinants for consumption choices as revenue and prices could not be observed.

[8] No household has declared using rustic chicken for festive meals.

Table 10. Yaoundé – Determinants of household's consumption of imported chicken (as first, second or third choice)

Parameter	Estimate (t-statistics)
C	- 0.10 (- 0.14)
Nb *	- 0.10 (- 1.82)
LevLife *	- 0.29 (- 1.75)
Status	- 0.07 (- 0.42)
Elab *	- 0.29 (- 1.74)
FC	+ 0.01 (+ 0.03)
N *	- 0.80 (- 1.32)
Number of observations: 180 ; $\rho^2_{MacFadden}$ *= 0.054 ; LR (zero slopes)= 10.39 [0.167]*	

*, **, *** indicate statistical significance respectively at 10%, 5%, 1% level

It seems that for festive meals, the way of cooking the chicken actually plays a major role in the choice of chicken type. The more elaborated (fumed, grilled, and roasted), the more households choose local chicken. Imported chicken is adapted for less elaborated cooking ways: fried and sauce chicken. Elab plays in the same sense as LevLife, as if fried and sauce were more popular ways of chicken at the difference to roasted, grilled and fumed chicken.

In Port-au-Prince, pooled households don't make any difference between usual and festive chicken consumption. Table 11a and 11b present results of estimation for the probability to consume rustic or local or imported chicken with a logit model. Coefficient have been estimated with those associated to the rustic one normalized to zero.

Table 11. Port-au-Prince – Determinants of effective household's consumption

11a) local chicken (compared to rustic one)

Parameter	Estimate (t-statistics)
C	- 1.32 (- 1.16)
Age **	+ 0.48 (+ 2.15)
Nb	- 0.08 (- 0.73)
LevLife	- 0.34 (- 1.45)
Status *	+ 0.42 (+ 1.71)
Elab	+ 0.04 (+ 1.05)
FC	- 0.47 (- 1.00)
N	- 1.08 (- 1.37)
11b) imported chicken (compared to rustic one)	
C	+ 0.28 (+ 0.78)
Age	+ 0.02 (+ 1.07)
Nb	- 0.07 (- 0.67)
LevLife ***	- 0.73 (- 3.36)
Status	- 0.07 (- 0.32)
Elab **	- 0.49 (- 2.29)
FC	- 0.52 (- 1.27)

N *	- 0.83 (- 1.15)
Number of observations: 180 ; $\rho^2_{MacFadden}$ *= 0,177 ; LR (zero slopes)= 33.62 [0.002]*	

*, **, *** indicate statistical significance respectively at 10%, 5%, 1% level

Table 12. Port-au-Prince – Determinants of household's consumption of imported chicken (as first, second or third choice)

Parameter	Estimate (t-statistics)
C **	+ 2.64 (+ 2.53)
Age **	- 0.03 (- 1.68)
Nb	+ 0.04 (+ 0.36)
LevLife **	- 0.45 (- 2.12)
Status **	- 0.48 (- 2.11)
Elab ***	- 0.69 (- 3.45)
FC	- 0.37 (- 0.87)
N	+ 0.05 (+ 0.71)
Number of observations: 180 ; $\rho^2_{MacFadden}$ *= 0.170 ; LR (zero slopes)= 30.91 [0.000]*	

*, **, *** indicate statistical significance respectively at 10%, 5%, 1% level

Results for Port-au-Prince show that variables LevLife and Status have significant effect on consumption of imported chicken. As expected, they all three have negative impact on imported chicken consumption. It is consistent with the hypothesis that imported chicken constitutes an imperfect substitute to domestic (rustic or local) chicken for well-off consumers even it let poor households access to poultry meat consumption. Note that the way the chicken is cooked (variable Elab) has significant impact on households' chicken type choice. Like in Yaoundé, fumed or sauce chicken seems to be correlated to domestic chicken's use, and usually requires whole chicken, contrary to fried chicken, for which frozen chicken cuts are particularly well adapted. The LR tests show that estimated coefficients are jointly significant. But, the $\rho^2_{MacFadden}$ for the two regression model, as a measure of goodness of fit of the regression are not very high.

c. Reserve prices

Ordinary least square regressions have been implemented to explain reserve prices for each type of chicken (nor for rustic chicken in Yaoundé, neither for local chicken in Port-au-Prince, because of lack of enounced corresponding reserve prices). We used usual chicken buying places as explanatory variables. Traditional urban market is the buying place reference in the following estimation.

Table 13. Yaoundé – Reserve prices

Local chicken

Parameter	Estimate (t-statistics)
C ***	+ 3535.21 (+ 16.85)
Nb	- 15.05 (- 0.65)
LevLife	- 8.60 (- 0.11)
Status ***	- 200.91 (- 2.70)
Elab *	- 150.05 (- 1.69)
FC	- 120.84 (- 0.71)
N	- 339.52 (- 1.11)
Shop	- 122.49 (- 0.78)
Smk	+ 256.87 (+ 0.60)
Periurb *	- 328.55 (- 1.60)
Farm *	+ 366.60 (+ 1.81)
Number of observations: 155 ; R^2 = 0.116 ; F (zero slopes)= 1.90 [0.049]	

*, **, *** indicate statistical significance respectively at 10%, 5%, 1% level

Imported chicken

Parameter	Estimate (t-statistics)
C ***	+ 1394.63 (+ 59.52)
Nb *	- 4.91 (- 1.85)
LevLife	- 8.74 (- 1.00)
Status	- 13.61 (- 1.43)
Elab ***	- 32.90 (- 4.98)
FC	- 5.19 (- 0.27)
N	- 28.51 (- 0.65)
Shop	+ 26.58 (+ 1.39)
Smk	- 7.23 (- 0.13)
Periurb	- 22.88 (- 0.66)
Farm	+ 25.13 (+ 0.94)
Number of observations: 142 ; R^2 = 0.135 ; F (zero slopes)= 2.05 [0.033]	

*, **, *** indicate statistical significance respectively at 10%, 5%, 1% level

For local chicken, Status has significant negative effect on household's reserve price. Maybe the fact that households in higher socio-professional position often eat chicken, gives them the possibility to find the way to pay less. Note that buying places have significant effect on local chicken reserve price: compared to traditional urban markets, local chicken is cheaper for households buying at peri-urban markets, more expensive for households buying at farms.

Elab have significant negative impact on imported but also local chicken's reserve prices. For the latter, the interpretation of such a result has to be refined.

Table 13. Port-au-Prince – Reserve prices

Rustic chicken

Parameter	Estimate (t-statistics)
C ***	+ 359.22 (+ 9.64)
Nb	+ 0.64 (+ 0.11)

LevLife **	+ 24.54	(+ 2.35)
Status	- 14.45	(- 1.35)
Elab	- 3.34	(- 0.33)
FC	- 8.77	(- 0.43)
N	+ 39.13	(+ 0.90)
Road **	- 38.66	(- 1.98)
Smk	+ 11.00	(+ 0.26)
Number of observations: 118 ; R^2 = 0.117 ; F (zero slopes)= 1.80 [0.085]		

*, **, *** indicate statistical significance respectively at 10%, 5%, 1% level

Imported chicken

Parameter	Estimate (t-statistics)	
C ***	+ 91.78	(+ 8.00)
Nb *	- 3.07	(- 2.24)
LevLife	+ 2.37	(+ 0.51)
Status	- 2.24	(- 0.87)
Elab ***	+ 0.54	(+ 0.17)
FC	- 13.87	(- 2.44)
N	+ 8.20	(+ 0.36)
Road	- 1.62	(- 0.24)
Smk	- 4.12	(- 0.33)
Number of observations: 158 ; R^2 = 0.078 ; F (zero slopes)= 1.58 [0.135]		

*, **, *** indicate statistical significance respectively at 10%, 5%, 1% level

In Port-au-Prince the sign of the impact of LevLife on chicken (rustic or imported) reserve price is positive. This result is consistent with the assumption chicken is a superior good in Haiti. Note that LevLife is only significant for rustic chicken's reserve price. Compared to traditional markets, road sellers seem to offer better prices for rustic chicken. Elab has significant positive impact on imported chicken as if households who usually cook elaborated whole chicken over-evaluate the price of imported chicken cuts.

In Port-au-Prince or in Yaoundé, the goodness of fit is rather bad. Indeed, the R^2 is always less than 0.20. Other functional forms have been tested for estimation, as log linear and semi-log. But these new specifications did not improve the goodness of fit. The main problem is that important explanatory variables were omitted because not collected.

4. Conclusion

Chicken cheap imports have been denounced by several non governmental organisations and associations, because it caused the collapse of many poultry husbandry and the loss of jobs in the local food chain. They notably recommend reinstituting high level of border tariff protection against imports of chicken pieces. Those organizations often argue that the liberalisation of chicken market is an emblematic example of the negative effects of trade liberalisation for developing countries due to international trade agreements.

Two similar surveys in Port-au-Prince (Haiti) and Yaoundé (Cameroon), aimed to identify the determinants of recent evolution of chicken consumption in urban area of two different developing countries. Starting from preliminary descriptive results of surveys, the paper tried to put the light on the differentiated effects of opening poultry domestic market to world imports on segments of urban population and households' ways of consuming the chicken.

As expected, and in conformity with associations studies[9] which describe the crisis of chicken industry which has occurred since the opening to frozen chicken imports, surveys we have carried out in both countries confirm that the relative lower cost of imported chicken has introduced a substitution of imports for domestic chicken and a large part of households declare they have increased their consumption of chicken.

In order to do distinguish between socio-economic consumer's characteristics and households' features of consuming the chicken, we have implemented AMC in order to define an aggregated continue variables reflecting those two aspects, and used obtained synthetic variables as parameters in Logit regressions. This combined method is particularly interesting to account for people socio-economic status in developing countries where it is not possible to get precise information about individual professional situation and revenues, but possible to get multiple qualitative data to that concern.

Results shows that if level of life actually has an impact on the type of chicken Yaoundé or Port-au-Prince households actually consume, and seems to play in favour local chicken compared to imported one, the way the chicken has been cooked also has effect. Imported chicken seems for example, not perfectly adapted to roasted, grilled or fumed chicken, contrary to fried and sauce mode of cooking. Furthermore, and especially in Yaoundé, it seems that the later is particularly significant in case of festive meals, while revenue effects are higher for usual chicken consumption. Port-au-Prince households don't make any difference between usual versus festive chicken consumption. Results dealing with reserve prices are not basically interpretable; however they suggest that chicken meat is considered as essential good by Cameroon urban households while as superior good by Haitian urban households. This intuition would merit to be confirmed, because it would have differentiated repercussions in terms of possible re-introduction of local chicken industry.

Those preliminary results have to be specified adding available data not already used. Hence the use of cut versus whole chicken has to be introduced to refine the variable Elab for

[9] Agir Ici, 2004 ; ACDIC, 2005

Yaoundé. It would be also interesting to check if LevLife, Status and Elab do impact the recent evolution (and not only effective consumption) in terms of chicken substitution. The work has also to be extended to home-out chicken consumption (at restaurant), in order to see if trends are similar as for households' chicken (domestic versus imported) consumption in Cameroon and Haiti, from global demand's point of view.

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Appendix 1 – Control variables and implementation of quota method

Distribution of households in global population and quota for establishing samples

Yaoundé Quarters	Population	%	Nb. of pooled households
Yaoundé 1 (+7)	53 187	29	52
Yaoundé 2 (+5)	39 263	21	38
Yaoundé 3	51 133	28	50
Yaoundé 4 (+6)	40 176	22	40
Total	183 759	100	180

Port-au-Prince Communes	Population	%	Nb. of pooled households
Port au Prince	736 618	36	66
Delmas	604 211	30	54
Carrefour	392 986	20	35
Pétion-Ville	280 214	14	25
Total	2 014 029	100	180

Allocation of pooled household following the same method for Yaoundé quarters, example of Yaoundé 1, using ECAM, 2000.

Household's size	Hut	House with several households	Modern villa	Buildings with several flats	Concessions
1	2	7	1	1	1
2 to 5	3	14	1	1	1
6 to 9	3	11	1	1	1
> 9	1	1	1	0	0
Total = 52	9	33	4	3	3