

## Hedonic Price Analysis of Dressed Chicken in Ghana

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### Abstract

*Ghanaian markets reveal differences between local and imported dressed chickens regarding quality attributes. Based on the hypothesis that products have utility bearing attributes whose value partly determine their price, this study identifies the attributes which influence price, consumer's choice and consumption of local and imported chicken in Ghana using a hedonic price regression model. Fifty consumers from Kumasi and time series data from 2001 to 2010 were used to establish the preference between local and imported chicken and to analyze price trends using a growth model. The findings indicate that consumers are willing to pay premiums for imported, non fatty and tender attributes of chicken. Prices of local chicken are about 57 percent higher but the volume of imported chicken has a faster growth rate. Bridging the price gap is anchored on higher and cost minimized production as well as paying attention to differences in attributes between the two products.*

**Keywords:** Hedonic price, dressed chicken, Kumasi

### 1. Introduction

Chicken is one of the major sources of animal protein all over the world (Barbut, 2002). Its protein content ranges from 22-25 grams per 100grams portions depending on the parts being considered (Ensminger, 1986). The product is therefore considered as an alternative to most red meat and is widely eaten across the globe including Ghana.

Following the adoption of economic liberalization policies in early 90s and the better access to the international markets, the socio-economic situation of the chicken industry in Ghana has changed considerably.

Despite an increasing demand of chicken in Ghana, domestic producers are not in a good position to meet this demand. According to FAO (2009), the world produced 79.3 million metric tons of chicken meat in 2008 with China, Russia, United States of America, Brazil and Japan being the world's leading producers. Out of this, Africa produced 3.4 million metric tons with Ghana contributing just about 0.9 percent of Africa's production. Ghana's average chicken production of about 8,500 metric tons between 2005 and 2011 is about 10% of local demand at the period. This was not the case from 1980-1990, when about 80 percent of the available chicken meat and eggs in the country were supplied locally. Domestic contribution to chicken consumption has since 2000 dropped from 72% to 10% in 2011 with the imported chicken gaining more competitive edge in most markets in the country. This situation led to the quadrupling of poultry imports from 20,752 metric tons in 2002 to 98,000 metric tons in 2011 metric tons (Flake and Ashitey, 2008). The decline in domestic production has been attributed to high cost of production (feed, additives, energy) (Flake and Ashitey, 2008). While poultry farmers in Europe and elsewhere produce at relatively lower cost of inputs, their counterparts in Ghana face great challenges in terms of inputs costs. According to Asuming-Brempong, Osei-Asare and Anim-somuah (2006), production cost for chicken in Ghana in 2005 was ₵17,376 per bird, and farmers were selling a bird at ₵21,000. In 2005, a locally produced or grown broiler was sold at GH₵ 2.80/kg whereas the same product from Europe were selling at only GH₵1.60/kg (Asuming-Brempong *et al.*, 2006). This is about 57 percent lower than the local product. According to the same study, the prices of imported chicken products were between 25- 30 percent lower than the cost of production in Ghana.

This has led to what many have described as “dumping” of chicken in the country due to the lower prices of the imported chicken. Atara, (2005), seems to have confirmed this with the statement “if traders sell their product in Africa, it is because the price is higher than the price offered by pet food producers in Europe”.

Though there are still local broiler chicken producers in the country, their products face great competition from the imported ones due to trade liberalization across the globe. Over 30 percent of imports of poultry products into West Africa come to Ghana (Christian Aid, 2005). The country relies mostly on USA and other European countries to augment the chicken produced by domestic farmers. Asuming-Bremponget *al.*, 2006 also show that thighs make up 50 to 90 percent of imports of dressed chicken.

Currently, chicken consumption in Ghana is between 75,000- 90,000 metric tons every year. The high consumption rates have not been achieved without foreign contributions. For instance, out of about 80,000 metric tons of chicken consumed in 2009 in Ghana, 80-85% was imported (FAO, 2010). Different studies have offered different explanations to the decline in the local production and the corresponding increment in importation (Asuming-Bremponget *al.*, 2006, Flake and Ashitey, 2008). Part of the reason could be the preference of Ghanaians for the imported product.

There are different factors that influence preference of consumers for a product and these factors are grouped differently in the literature. Kahn (1981) as cited in (Agbekporu, 2005) grouped these factors into intrinsic and extrinsic factors. According to Kahn (1981), intrinsic factors of a commodity that influence choice include; color, texture, flavor and freshness which make up quality and quantity. Extrinsic factors are the environment, advertisement and merchandising, and time or seasonal variations. He further notes that, the extrinsic factors are related to the food item but not physically and could also include the price, country of origin and for some items, the brand name. Randall and Sanjur (1981) also writing on factors influencing food preference, have proposed three categories in a model as: individual, food and environment. Gains (1996) also hypothesized that, any food-related behavior is as a result of the interaction between the food itself, the consumer and the context or situation within which the interaction takes place. He then concludes that it is important that food manufacturers understand who might buy their product, what potential buyers perceive the product to be like and where and when they might consume it. It can be deduced from this literature how significant the attributes or characteristics of a product are in consumption surveys as well as product price determination.

A careful observation of the Ghanaian markets reveals some differences in the quality attributes of local and imported dressed chickens. For instance, while local dressed chickens are mostly whole chickens and fresh, the imported ones are available as whole and parts (wings, thighs, gizzard packs and chicken breasts) and are frozen. Based on the hypothesis that products have utility bearing attributes and that the value of those attributes partly determine the price of the product, this paper identifies which of these factors have significant influence on price and therefore drive chicken consumption in Ghana. The paper addresses the following questions:

- What is the consumers’ preference between local and imported dressed chicken?
- What are the trends in prices of both local and imported dressed chicken in the market?
- What are the different characteristics of dressed chicken that influence choice and price?
- To what extent do these characteristics affect the price of dressed chicken in the market?

### **1.1 Objectives of the Study**

The main objective of the paper is to determine the quality characteristics of dressed chicken that influence consumers’ preference and how these affect the prices of chicken.

The specific objectives are; to describe trends in prices of both local and imported chicken from 2001-2010, identify and rank the characteristics of dressed chickens that influence choice and consumption and price for that matter, and finally quantify the effects of factors that influence chicken price in Kumasi market in Ghana.

## **2. Methods**

### **2.1 Data and Sampling**

Both qualitative and quantitative data were used for the study and these were both primary and secondary data. The primary data was collected using structured questionnaires.

Simple random sampling technique was used to select 50 consumers in the Kwame Nkrumah University of Science and Technology community. The sampling frame for data collection of the research included: lecturers, students, workers and sellers in the community. The stratified simple random sampling technique was used where consumers were randomly selected from each group. Time series data on prices from 2001-2010 was also obtained from Ministry of Food and Agriculture (MoFA).

**2.2 Method of Data Analysis**

The first objective of assessing trends in the prices was achieved with a growth model and descriptive statistics were also used to analyze the variation in price trends.

The growth model is specified as:

$$P_t = e^{a+btT+\mu} \dots\dots\dots \text{(Local chicken)} \quad \text{and} \quad P_i = e^{a+biT+\mu} \dots\dots\dots \text{(Imported chicken)}$$

$$\ln P_t = a_t + b_tT + \mu_t \quad \text{Also} \quad \ln P_i = a_i + b_iT + \mu_i$$

Where *P<sub>t</sub>* and *P<sub>i</sub>* are price of local and imported chicken respectively, *a<sub>t</sub>* and *a<sub>i</sub>* is the price at the initial year for local and imported chicken respectively, *b<sub>t</sub>* and *b<sub>i</sub>* are the growth rates of prices of local and imported chicken respectively and T is time period. *μ<sub>t</sub>* and *μ<sub>i</sub>* are the respective error terms. The models were estimated using secondary data of prices over a ten year period (2001-2010)

To identify and rank the characteristics that affect consumers’ preference for dressed chickens, a list of attributes of dressed chicken identified from literature and through observation in the market was presented to consumers for confirmation and ranking. The ranking of factors and degree of agreement among consumers was ascertained using the Kendall’s coefficient of concordance test. The Kendall’s test is mostly used rank constraints or problems from the most pressing to the least pressing and then measure the degree of concordance among respondents involved. The factors were ranked using the numbers, 1, 2, 3....., n from the most influencing factor to the least influencing. The total rank score computed was used to calculate the concordance coefficient, **W** and to test the degree of agreement. The range of the coefficient **W** is between zero (0) and one (1). Where **W=1** Means same ranking for all respondents and **W=0** mean maximum disagreement between all respondents. The formula for the coefficient of concordance is:

$$W = \frac{(\sum T^2 - (\sum T)^2/n) /n}{m^2 (n^2 - 1)}$$

Where: **T**= sum of ranks for each factor being ranked,  
**m**= number of rankings and **n**= number of factors being ranked.

The significance of coefficient of concordance was tested using the F- test.

*Hypotheses and the Decision Rule*

**H<sub>0</sub>**: There is no agreement among consumers in their rankings of attributes influencing their preference and for that matter the price of chicken.

Hypothesis 1: There is an agreement among respondent or consumers in their ranking.

If F-calculated is greater than the F-critical, then the decision will be to reject the null hypothesis and conclude that there is an agreement among the ranking of consumers.

To analyze dressed chicken attributes that affect market price, a hedonic price model was used to quantify the effect of chicken characteristics on the price. The term hedonic was believed to have been first used by Courth (1939) to describe the weighting of the relative importance of attributes during his construction of the index of “usefulness and desirability” (Goodman 1998) as cited by (Agbekpornu 2005). The model has since then, been used in diverse areas of research. Williams, Okike and Spycher (2006) used hedonic model to assess how the quality attributes of cattle in the West African corridor affect the price. In their research, they observed that, different attributes influence the prices of cattle differently.

Some of the factors they identified include: age of the cattle, sex, body condition rating, breed, and purpose of purchase, season of sale, market location, type of buyer and type of seller. Waugh (1928) cited in Agbekporu (2005), also tried to identify the different characteristics of tomatoes, asparagus and cucumber that were accounting for the then variations in prices in the vegetable markets in Boston. Schamel, Gabbert and Witzke (1998) also analyzed the U. S. wine market based on sensory quality ratings, individual wine quality and regional reputation indicators for chardonnay (white wine) and cabernet sauvignon (red wine). His results suggested that U. S. wine consumers were willing to pay higher quality premium for red wine compared to white wine and that, regional reputation and individual quality indicators seemed to be more relevant to white wine consumers in the U. S. Although some researchers, for instance Rosen (1974) identified some weaknesses of the model, it has been used extensively in the area of research since there are no perfect models without limitations.

Hedonic price analysis is regarded as an indirect method of measuring attitudes of consumers and their valuation of different attributes of a good. The assumption is that, there is a relation between prices and attributes of goods. The model is also based on the fact that, consumers derive value or satisfaction from the attributes of a product rather than just the good (Melton, *et al.*, 1996). In this paper, the prevailing market prices were used as proxy for the prices consumers are willing to pay.

**2.3 Theoretical Framework of the Hedonic Model**

Assuming consumers consume a type of dressed chicken with **n** characteristics, X1, X2, X3....Xn and the characteristics vary continuously so that Q (X) represents a type of dressed chicken. The utility function of a consumer can be written as:  $U[Q(X)]$

Maximizing this utility function subject to budget constraint yields a spectrum of demand functions for Q:  $Q(X) = f [PQ, K]$  (Agbekporu, 2005):

Where PQ is the price vector and K is a vector of consumer characteristics like income, sex and age. Prices and quantity will be determined by supply and demand simultaneously. It is assumed that the prices are given to consumers and consumers then make their choices by equating the marginal utility of each characteristic to its marginal price:

$P = f(X_1, X_2, X_3, \dots, X_n, K)$  and  $P_i = \frac{\partial f}{\partial x_i}$  where P is the price of the product,  $X_i$  is the  $i^{th}$  characteristics and  $P_i$  is the partial derivative of price with respect to the  $i^{th}$  characteristics (Freeman, 1992).

**2.4 The Empirical Hedonic Model**

$$P_{chicken} = \hat{\alpha}_0 + \hat{\alpha}_1 fat + \hat{\alpha}_2 origin + \hat{\alpha}_3 package + \hat{\alpha}_4 tender + \hat{\alpha}_5 storage + \hat{\alpha}_6 age + \hat{\alpha}_7 income + \mu$$

(Gujarati 2004). These variables are operationalized as:

<b>Variable</b>	<b>Definition</b>
Price	Retail price of dressed chicken, (GH¢/kg)
Fat (fattiness)	Fatty =1 non fatty = 0
Package	Whole = 1 In parts = 0
Tender (tenderness)	Tender=1 hard= 0
Origin	Imported=1 local= 0
Storage	Fresh =1 frozen = 0
Age	Age of consumers in years
Income	Income of consumers in GH¢
$\mu$	Error term

A student t-test of significance was then used to check whether there is significant influence of the characteristics (taste, tenderness, form of sale) on the price Null hypothesis (Ho): no significant influence of characteristics on the price of chicken Alternate hypothesis (HA): there is significant influence of characteristics on the price of chicken

### 3. Results and Discussion

#### 3.1 Trend in Prices of Local and Imported Chicken

The prices of both local and imported chicken have increased steadily over the period although the local prices are higher. Figure 1 shows the trend in prices of both local and imported chicken over the ten year period.

The higher prices of the local chicken have been attributed to high input cost in the sector due to lack of subsidy from government on feeds which contribute about 90% of total production cost as has been demanded by poultry farmers in the country. The situation is however, different for imported which is produced at relatively lower input costs.

##### *Comparison of Average Prices of Local and Imported Chicken*

Prices of local and imported chicken over the ten year period (2001-2010) revealed some significant differences between the two products at each period. The average price for local chicken in 2001 was about 67% higher than the imported chicken. The gap further widened to about 83% in 2002. The average price gap since then has experienced some variations with the average gap over the ten year period (2001-2010) being 60.41%. Table 1 shows the price gaps over the ten year period.

From the growth model, it was found that price of the local chicken per kilogram grew at 8.9% per annum while the price per kilogram of the imported chicken grew at 11.54% per annum. The price of the imported chicken was seen to be growing at a faster rate compared to the local one although the latter is relatively higher over the ten year period. The faster growth of prices of imported chick was partly due to depreciation of the Ghanaian currency. Over the last decade, the Ghanaian currency has rapidly depreciated in relation its major trading currencies i.e. US dollar, euro, pound sterling. For instance, between December 2008 and June 2012, the value of the Cedi relative to US\$1 had fallen by 77.3%. The estimated results of the growth models:

$$\ln P_i = -177.965 + 0.090T \dots\dots\dots \text{Local chicken}$$

s.e= (11.98262) (0.005975) R2 = 0.965 Adjusted R2 = 0.961

$$\ln P_i = -230.908 + 0.115T \dots\dots\dots \text{Imported chicken}$$

s.e= (10.21835) (0.005095) R2 = 0.985 Adjusted R2 = 0.983.

#### 3.2 Attributes of Dressed Chicken that Influence Consumer Choice

Attributes identified include; storage, fattiness, tenderness, origin and package and taste. These factors were presented to respondents to confirm and rank from the most important to the least important. The mean ranks from the respondents suggest that, origin of the product is the most important attributes influencing consumers' choice and consumption.

Tenderness was ranked second. According to respondents, different meals require either hard or soft type of chicken for instance, hard chicken for stew and soft chicken for soup. Thus, hard or soft type of chicken is considered depending on the meal been prepared.

Fat content was the third attribute on the rankings. Respondents who preferred local chicken over imported laid emphasis on fattiness as a factor influencing their purchasing decisions. According to them, the weight of the live chicken was used as the determinant of the fat content which to them determines how well it had been fed and how healthy it was.

Storage and package were ranked fourth and fifth respectively. Taste was ranked as the least important by respondent. Table 2 shows the results of the rankings from the Kendall's procedure.

F – Test results from the Kendall's coefficient indicated that, there is 53.6% agreement among the rankings of the respondents. This is significant at 95% level of confidence

### 3.3 Effects of Chicken Attributes on Price

Among the attributes identified include: origin, package, storage, fattiness and tenderness. From the results shown in table 3, Origin, Storage and Package of chicken significantly influence price with the  $R^2$  value indicating that 70.1% of variations in chicken prices are jointly caused by the chicken attributes identified.

Origin of chicken influence price positively and the coefficient is significant at one percent. Consumers are therefore willing to pay premium for imported chicken compared to the local chicken. This could be attributed to some of the reasons given earlier. Availability on market, ease of obtaining the preferred parts and ease with preparation were some of the reasons.

The coefficient of the variable storage is -1.06 indicating that consumers are willing to pay GH¢1.06 less for frozen chicken all other things held constant. However, the study also found that 52% of the respondents prefer imported chicken which is frozen. Therefore although many consumers are not willing to pay premium for frozen imported chicken, they still do so based on their reasons such as availability on the markets, soft/tender to chew, affordability and easy access to preferred parts.

The estimated parameter for package also indicates negative relationship between price and package. This is also significant at one percent. The estimate indicates that respondent would pay GH¢ 1.53 less for chicken parts indicating preference for a whole chicken. Most often, imported chickens are available in parts and this again presents another line of contradiction for the fact that 52% of total respondents prefer imported chicken.

The results from the model show positive influence of tenderness and fattiness on price. However, their estimated parameters were not significant.

These two attributes are however ranked second and third respectively in the rankings of characteristics of chicken influencing its choice and consumption in Kumasi. This suggests that, although consumers take into consideration some chicken attributes before purchase, there is no way they can measure these characteristics of the product especially the imported frozen ones

### 4. Conclusion and Recommendations

Availability of imported chicken, packaged in various parts coupled with its lower prices, tenderness and other desirable attributes have endeared it to many consumers in Ghana. It is therefore highly preferred to the local chickens which mostly are whole live birds. The fresh nature of the local product however attracts some premiums from consumers as identified in the hedonic model. Chicken thigh which was found to be preferred much by consumers in Kumasi also confirms the findings by Asuming-Brempong *et al.* (2006) that the thigh is the most preferred chicken part in Ghana. Chicken gizzards and wings are ranked second and third respectively while the chicken breast which is much preferred in Europe is the least preferred part in Ghana.

Based on the various findings from the study, the following recommendations can be made. First, in order to save most domestic poultry businesses from collapsing, much attention needs to be paid to local farmers. Although the higher percentages of respondents prefer imported to the local chicken, there are quite a number of consumers who prefer the local chicken. It therefore calls for some quality attributes of dressed chicken to be incorporated into their production by domestic farmers. The local chicken competes on quality (freshly dressed chicken or not frozen for a long time) rather than price. Imported chicken does not taste as good as the local. Availability of the fresh local chicken in various preferred parts and in the tender forms (that is broilers) will make the local chicken more competitive.

Though we did not discover the differences in prices as the drive for the imported chicken, Government and other stakeholders in the local production sector could also work at bridging the price gap between the local and imported chicken since this could play a part in consumers' preference for the imported chicken. This could be done through subsidization of inputs for local farmers in order to lower their production costs. The rapid growth in prices of imported chicken due to currency depreciation offers opportunity for local producers to increase price competitiveness. The Government can protect local producers by not artificially appreciating the value of the domestic currency.

To sellers of dressed chicken products, chicken thighs remain the most preferred parts in Kumasi as might already be known by some sellers. However, gizzards were also found to attract some consumers in the study area.

Consumers consider fattiness of chicken products as the third most influencing factor in their choice and consumption of chicken and were willing to pay premium for more fatty chicken products even though the coefficient from the regression was not significant. However, there is no measure of such attribute in the imported products which were mostly frozen but preferred by a higher percentage of consumers in Kumasi. This perhaps indicates the lack of awareness of health problems among consumers in terms of consumption of fatty meats and also calls for measures such as increasing awareness about the quality attributes of chicken breast (Barbut, 2002) as well as making it available.

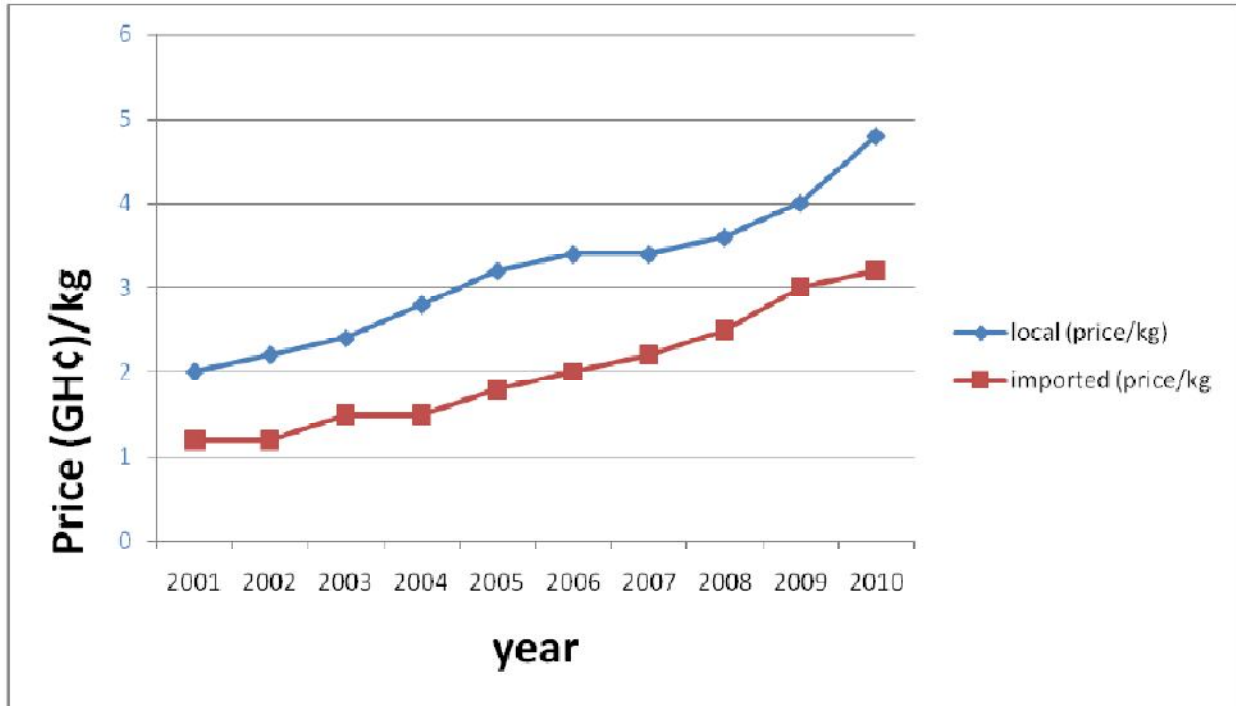
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**Tables and Figures**



**Figure 1: Price Trends of Local and Imported Chicken**

**Table 1: Prices of Local and Imported Chicken**

Year	Local (GH¢/kg)	Imported (GH¢/kg)	Difference	Percentage difference (%)
2001	2.0	1.2	0.8	66.7
2002	2.2	1.2	1.0	83.3
2003	2.4	1.5	0.9	60.0
2004	2.8	1.5	1.3	86.7
2005	3.2	1.8	1.0	55.6
2006	3.4	2.0	1.4	70.0
2007	3.4	2.2	1.2	54.5
2008	3.6	2.5	1.1	44.0
2009	4.0	3.0	1.0	33.3
2010	4.8	3.2	1.6	50.0



Table 2: Rankings of Chicken Attributes by Kendall's Procedure

FACTORS	MEAN RANKS	RANKS
Origin	2.40	1
Tenderness	2.49	2
Fattiness	2.92	3
Storage	3.22	4
Package	3.92	5
Taste	3.98	6

Table 3: Factors Influencing Chicken Prices

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ORIGIN	0.992369***	0.318418	3.116560	0.0033
TENDERNESS	0.287551	0.250964	1.145786	0.2584
STORAGE	-1.060033***	0.308178	-3.439674	0.0013
FATTINESS	0.083447	0.222201	0.375548	0.7091
PACKAGE	-1.532489***	0.287928	-5.322480	0.0000
AGE	0.006968	0.020547	0.339139	0.7362
INCOME	-0.000291	0.000597	-0.486786	0.6289
C	5.549239	0.558268	9.940100	0.0000
R-squared	0.701020	Mean dependent var	5.052000	
Adjusted R-squared	0.651190	S.D. dependent var	1.223117	
S.E. of regression	0.722375	Akaike info criterion	2.333102	
Sum squared resid	21.91668	Schwarz criterion	2.639026	
Log likelihood	-50.32755	F-statistic	14.06822	
Durbin-Watson stat	1.162256	Prob(F-statistic)	0.000000	

\*\*\* P&lt; 0.01

Dependent Variable: PRICE

n = 50

Method: Least Squares