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Can Local Products Compete against Imports in West Africa?

Supply- and Demand-side Perspectives on Chicken, Rice, and Tilapia in Accra, Ghana

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Abstract

This paper examines the prospects for import substitution in West Africa by analyzing the preferences of urban consumers for food product attributes. We use market surveys, choice experiments, and experimental auctions to assess price and quality competitiveness of locally-produced chicken, rice, and tilapia in Accra, Ghana. For the price analysis, we compare market prices of imported and local counterparts, and we compare the local costs of production to production costs in major exporting countries. For the quality analysis, we compare consumer perceptions and demand for quality attributes of local versus imported products using data from field experiments with 1,322 consumers. Our findings suggest that among the three products, rice has the lowest prospects for import substitution, due to supply- and demand-side constraints to local competitiveness. For rice, consumers prefer imported products, they perceive imports as having better quality than local products, and they are willing to pay a premium for imports. For chicken, consumers have a strong preference for local products, but the potential for expanding chicken production can only be met if production and processing costs can be reduced significantly to boost price competitiveness. For tilapia, a high preference for freshness provides a natural barrier to import entry, and the comparative advantage of local production can be enhanced by making continuous improvements in seed and extension systems, industry coordination, certification, and regulation.

Keywords: local competitiveness, import substitution strategies, willingness-to-pay, choice experiments, experimental auctions, West Africa

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1 Introduction

Agricultural producers in West Africa are facing the pressures of competing against food imports to meet the changing tastes and preferences of urban, middle-class consumers (Laroche-Dupraz and Postolle 2013). West African countries are expected to continue importing significant shares of their food consumption baskets over the next decade (OECD 2011; Zhou and Staatz 2016). Although imports have provided cheaper food, especially for urban consumers (Demont, Rutsaert, Ndour, and Verbeke 2013), competitiveness of local production is critical from a food security standpoint (Van-Ittersum et al. 2016), to assuage concerns about the share of food budgets that go to local producers (Timmer 2004, 2009), and to cater for the projected sharp rises in demand for cereals, meat, and fish (Van-Ittersum et al. 2016; Zhou and Staatz 2016). Policymakers and development agencies are therefore increasingly concerned about boosting the competitiveness of local value chains.[1] In the past, trade restrictions and subsidies for local production were the main responses to import pressures, but recent evidence suggests that a less-explored third option would be to influence a demand shift by promoting attributes of local products (Demont, Rutsaert, Ndour, and Verbeke 2013). However, the success of such efforts on the demand side will depend on consumers' willingness to pay for those attributes and the prospects for changing preferences by providing information about local products. Measuring consumer preferences for local products is an empirical exercise that depends on several factors including perception and substitutability (Darby et al. 2008; Balogh et al. 2016; Lazaro, Sam, and Thompson 2017).

What then are the prospects for improving the price and quality competitiveness of locally-produced foods against imports in West Africa? And how can agricultural producers improve the non-price attributes of their products and compete more effectively based on better quality? This paper addresses these questions by investigating the competitiveness of local agricultural commodities in Ghana vis-à-vis imported counterparts. Specifically, we use choice experiments and auctions to examine the factors driving the preferences of urban consumers in Ghana for chicken, rice, and tilapia. This paper focuses on quality attributes, and contributes to earlier studies on price competitiveness of Ghana's agricultural sector (Ragasa, Chapoto, and Kolavalli 2014; Ragasa et al. 2014; Tripp and Ragasa 2015; Ragasa, Lambrecht, and Kufoalor 2018; Ragasa et al. 2018; Andam, Johnson, et al. 2017)

This paper contributes to the literature on competitiveness of agricultural value chains in West Africa. One line of research has recently evaluated the opportunities for rice producers in the region to substitute for imports (Demont et al. 2013; Demont, Fiamohe, and Kinkpé 2017). We augment this literature in two ways. First, this paper extends the research beyond staples by analyzing consumer preferences for higher-value agricultural products, namely meat (chicken) and fish (tilapia). As diets change across West Africa, agricultural producers will need to be competitive in these less traditional value chains that are going to be in high demand among urban consumers. Diet change is usually driven by consumer preferences, and in Asia and Latin America the local agricultural sector typically responded through commercialization, processing, and trade (Delgado, Narrod, and Tiongco 2008; Reardon et al. 2015). However, in West Africa, the supply response has relied less on increased local production and more on increasing food imports (Hollinger and Staatz 2015; Zhou and Staatz

[1] For example, in 2016 the African Development Bank adopted a 'Feed Africa' strategy for agricultural investments, committing to support projects to enhance local competitiveness in order to meet a goal of converting Africa from a net food importing continent to a net food exporter. In Ghana, the government has recently implemented a large-scale input subsidy intervention for one million farmers, called Planting for Food and Jobs (PFJ) to increase local production of staples such as maize and rice, and the government is planning to invest in similar interventions for chicken and tilapia farmers in 2019-2021.

2016). Second, this paper extends the range of methods applied to research on local competitiveness in developing countries by employing a combination of stated preference (choice experiments) and revealed preference (auctions). Existing studies have mostly used the latter approach in field experiments (Demont, Rutsaert, Ndour, and Verbeke 2013; Demont, Fiamohe, and Kinkpé 2017). Third, it combines both supply- and demand-side perspectives in analyzing the issue of competitiveness by looking at both production costs and price comparisons and quality competitiveness. Many studies have addressed either side (see Ragasa, Chapoto, and Kolavalli 2014; Ragasa et al. 2014; Ragasa, Lambrecht, and Kufoalor 2018; Ragasa et al. 2018 on the supply side;Demont et al. 2013 and Demont, Fiamohe, and Kinkpé 2017 on the demand side), but a major gap in the literature is analysing and comparing both sides.

The three products examined in this paper – chicken, rice, and tilapia – are emblematic of the ongoing food system transformation in Ghana and its implications for structural change in the economy. Chicken and rice are frequently mentioned in policy debates on local competitiveness. The two products have potential for being the focus of Ghana's import substitution strategies (Diao, Harttgen, and McMillan 2017). As in other West African countries, rice is now a staple food in Ghana's cities, and the bulk of rice consumed in Ghana has been imported since the 1980s, with imports coming mainly from East Asia. For the last decade, Ghana has been importing 60 percent of its rice consumption (Ragasa et al. 2014). Along with imports, local rice production and productivity has also increased (Ragasa et al. 2014). Chicken consumption has increased rapidly since 2000, and like rice, the bulk of local consumption has come from imports (Andam, Johnson, et al. 2017). However, unlike rice where local production has grown alongside imports, local chicken production, especially production and packaging of the parts of chicken preferred by urban consumers, has been negligible compared with frozen imports (Sumberg, Awo, and Kwadzo 2017).

Tilapia is an interesting case because it is an emerging value chain in Ghana driven by the suitability of the Lake Volta for fish culture (Ragasa et al. 2018). Unlike chicken, Ghana's tilapia value chain is currently protected by an import ban, but like chicken, the industry is potentially subject to growing pressure from cheaper imports, particularly from China and other Asian countries. Given that there are anecdotes about illegally-imported tilapia in the market and given the possibility of a removal of trade protection, tilapia may also face competitive pressures from imports in the future. Therefore, for tilapia, we focus on estimating the value that consumers place on product attributes connected with local production, such as freshness, taste, food safety, and "localness".

Household expenditure data illustrate the growing importance of the three products in Ghanaian diets, especially when per capita expenditures on the three products are compared with per capita expenditure on maize, the main staple cereal.[2] Nationwide, the average household per capita expenditure on rice was 3.3 times the average per capita expenditure on maize in 2012/2013, and this rice-maize expenditure ratio had increased to 4.1 by 2017/2018. The ratio of households' per capita chicken expenditure to per capita maize expenditure was 1.3 in 2012/2013 and 1.4 in 2017/2018. For tilapia, the ratio of per capita expenditure on fresh, frozen, or salted tilapia (*koobi*) to per capita expenditure on maize was 0.4 in 2017/2018.[3] It is important to note that this dietary transition is occurring even more rapidly in urban areas. In Accra, the rice-maize per capita expenditure ratio increased from 3.8 to 6.0

[2] This section is based on the authors' calculations using Ghana Living Standards Survey rounds 6 and 7 (GLSS6 and GLSS7) collected in 2012/2013 and 2017/2018 respectively.
[3] For tilapia, expenditure data were not collected before the GLSS7 round.

in the five-year period, and the chicken-maize per capita expenditure ratio nearly doubled, from 1.6 in 2012/2013 to 2.8 in 2017/2018.

Given the growing importance of products such as chicken and rice in Ghanaian diets, it is not surprising that the policy discourse on Ghana's agricultural development is broadly in favor of supporting local production and reducing reliance on imports, so that local producers can derive benefits from the dietary transition. In response to the perceived disadvantages accruing to the country from imports of chicken and rice, such as the import bill, the Ghanaian government's main policy intervention in the agricultural sector, the Planting for Food and Jobs (PFJ) program, is seeking to promote rice production by 49 percent to displace imported rice (MOFA 2017). The PFJ also seeks to expand production of feed grains (maize and soya bean), with the goal of supporting local chicken production to displace imported chicken. The government also announced that it will invest in subsidy programs for chicken (Rearing for Food and Jobs) and tilapia (Aquaculture for Food and Jobs) in the next three years. The success of such policies in Ghana and other West African countries will depend crucially on consumers' willingness to pay for locally-produced food items, especially when imported items are available with prices or attributes that may be more attractive to consumers.

To assess competitiveness of the three local products in Ghana, we examine both price and quality competitiveness. For the former, we compare market prices of imported and local counterparts in Accra markets, and cost of production in Ghana compared to major exporting and other comparable countries. For the latter, we study consumer perceptions of and demand for quality attributes of local versus imported products. We use both revealed and stated preference approach to measure consumers' willingness to pay (WTP) for these products. Our findings indicate that among the three products, rice has the lowest prospects for import substitution, because consumers have strong preferences for the qualities of imported rice. However, local chicken producers can capitalize on consumer preferences for locally-produced chicken, if local production and processing costs can be reduced, whereas for tilapia, consumer preference for freshness offers a natural advantage over imports.

In the next section we first provide a descriptive assessment of consumer preferences for imports in Ghana, using recent household expenditure data for local and imported rice brands. Section 3 describes the theoretical frameworks for our analyses, and section 4 describes the data and methods. The results and discussion are in section 5 and we conclude in section 6 with implications for import substitution strategies for Ghana and West Africa.

2 Are consumer preferences biased towards imports?

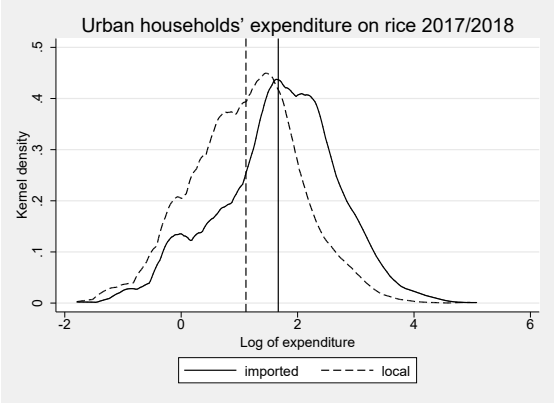
Official data on imports suggest a strong preference for imports among West African consumers. We begin with a descriptive assessment of the current situation for rice, based on data from the last two rounds of the Ghana Living Standards Survey (GLSS) collected in 2012/2013 (GLSS round 6) and 2017/2018 (GLSS round 7). The survey asks respondents to record household weekly expenditures on food items, with enumerators visiting the same household five times in the survey period for a total 35-day recall period. The resulting nationally representative datasets are useful for analyzing consumer preferences.

In GLSS7, enumerators asked for expenditures on 13 imported rice brands and five local rice brands as well as generic products ("other imported" and "other local"). In Figure 1a, we show kernel density estimates and means of the expenditure on imported versus local brands by urban (top panel) and rural (bottom panel) households. Figure 1a suggests that both

rural and urban households prefer imported rice, and that this preference is stronger in urban areas. Figure 1b repeats the comparison for poor and nonpoor households[4], and shows a large difference in distributions and means of nonpoor households' purchases of imported rice compared with their purchases of local rice. For poor households there does not seem to be a preference for imports over local rice.[5]

[4] We use the poverty thresholds defined by the Ghana Statistical Service in official data on poverty levels in Ghana. This is a consumption-based measure. Households are classified as poor if the household's food and nonfood expenditure was less than GH₵1,314 (about US$292 in 2018) per adult equivalent per year.

[5] Figures 1a and 1b suggest that consumer preferences for imported rice over local rice are stronger for urban than rural, and for nonpoor than poor households, but the findings cannot be conclusive. Ideally one could accurately assess consumer preferences with data on quantities consumed, since households may be facing different prices for their rice products. However, although GLSS7 includes data on amounts consumed by the household and market data for prices, the quantity units are not comparable across households and communities, making it problematic to conduct analysis of quantities consumed.



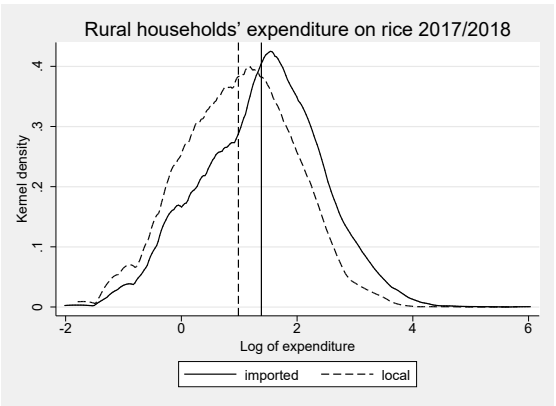
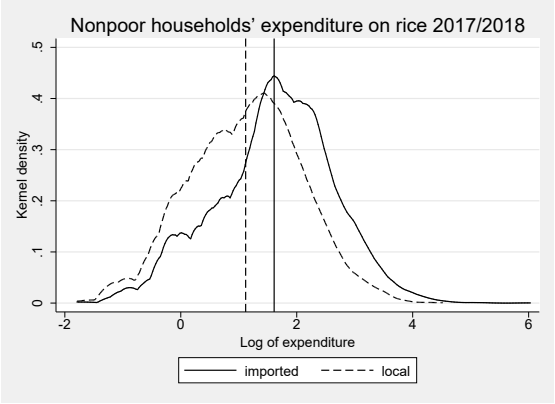


Figure 1a. Urban and rural households' expenditure on imported and local rice products in 2017/2018 (kernel density estimates and means).



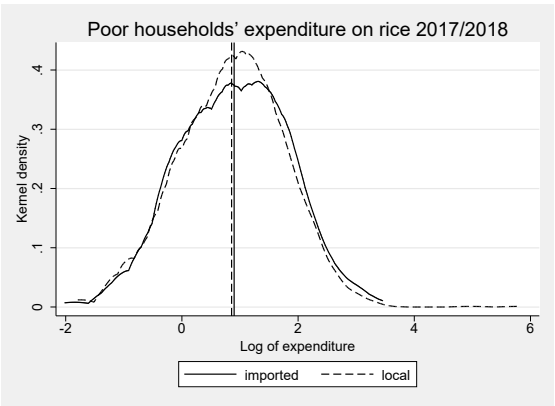


Figure 1b. Poor and nonpoor households' expenditure on imported and local rice products in 2017/2018

Figure 1. Household expenditure on imported and local rice

Source: Authors' calculations based on Ghana Living Standards Survey round 7 (GLSS7) data.

Note: Vertical lines indicate the means of kernel density graphs. Horizontal axis is the log of expenditure on rice products. For Figure 1a, we follow the definitions of the Ghana Statistical Service (GSS) such that urban localities are classified as those with a population of 5,000 or more, and rural otherwise. For Figure 1b, we use the poverty thresholds defined by the GSS in GLSS7, which is a consumption-based measure. Households are classified as poor if the household's food and non-food expenditure was less than GH¢1,314 (about US$292 in 2018) per adult equivalent per year.

We can also analyze consumer preferences by comparing expenditures on imported and local rice with expenditures on other cereals for the recent five-year period from 2012/2013 to 2017/2018. We calculate average weekly expenditures on imported and local rice products, maize, breads and biscuits, and other cereals, as a share of total expenditure on cereals, and we compare household expenditure by location (urban and rural) and poverty status.

In Table 1, three descriptive findings emerge from this assessment, confirming the importance of rice as a staple in Ghanaian diets, and the current dominance of imported rice. First, in line with the expectation that maize consumption will decrease, and rice consumption will increase as households become more urban and wealthier, Table 1 shows a sharp decrease in the share of household expenditure on maize from 27 percent to 14 percent for nonpoor households over the five-year period, and from 21 percent to 13 percent for urban households, while the share of expenditure on maize for poor households and rural households remains unchanged at around 19-23 percent. In contrast, expenditure shares for rice are around 30-37 percent (Table 1). Secondly, the nonpoor households do have more of a taste for imports than poor households, when we consider expenditure shares of imported versus local rice. While nonpoor households spent about 27 percent of their cereal expenditure on imported rice and about 10 percent on local rice in both time periods, for poor households, expenditure shares on local rice were slightly higher in 2012/2013 than the expenditure share on imported rice (17 percent compared to 13 percent) and this difference had increased to 28 percent on local rice versus 9 percent on imported rice in 2017/2018 (Table 1).

Table 1. Household expenditure on selected grain and cereal products as a share (%) of total household grain and cereal expenditure in 2012/13 and 2017/18

	2012/13		2017/18	
	Poor households	Nonpoor households	Poor households	Nonpoor households
Local rice	17.1	9.7	27.7	9.6
Imported rice	13.2	26.8	9.0	26.5
Maize	22.8	20.8	22.4	14.2
Breads/biscuits	24.3	34.3	26.0	36.0
Other cereals	22.6	8.4	14.9	13.7
Number of households	3830	12549	3097	10113
	Rural households	Urban households	Rural households	Urban households
Local rice	15.1	6.8	19.4	6.9
Imported rice	18.8	29.6	18.8	26.8
Maize	21.9	20.6	18.5	13.0
Breads/biscuits	27.4	37.7	29.4	39.1
Other cereals	16.8	5.3	13.8	14.2
Number of households	9076	7303	7353	5857

Source: Authors' calculations based on Ghana Living Standards Survey round 7 (GLSS7) data.

Note: Maize includes white and yellow maize and corn dough. Other cereal products include flours, pasta, millet sorghum, and baby cereals. We use the poverty thresholds defined by the Ghana Statistical Service in GLSS7, which is a consumption-based measure. Households are classified as poor if the household's food and nonfood expenditure was less than GH₵1,314 (about US$292 in 2018) per adult equivalent per year. We follow the definitions of the Ghana Statistical Service (GSS) such that urban localities are classified as those with a population of 5,000 or more, and rural otherwise.

What explains the higher expenditures on imported rice than on local rice, especially among nonpoor and urban households, which indicates a preference for imports? Anecdotal evidence from market interviews suggests that lack of information and awareness of local brands is a likely explanation. This is linked to the low availability of local rice brands in the shops where the nonpoor and urban households buy their rice. Another possible reason for import preference is the poorer quality of the local brands, although a visual inspection of a sample of these brands by the research team suggests that local brands are of similar quality and purity as most imported brands (except the imported brands such as Gino that are most expensive and branded as premium). A third possibility is the general liking or preference on "foreignness" or something imported versus bias against "local" (see (Demont et al. 2013; Demont, Fiamohe, and Kinkpé 2017). This paper aims to provide empirical evidence on the most likely reasons for these.

3 Theoretical frameworks

Price or cost competitiveness

Price competitiveness of Ghana's farmers in producing the commodities is an important consideration embedded in this research on the competitiveness of local production against imports. In the agricultural economics literature, there are several approaches for assessing competitiveness, including domestic resource cost (DRC) (Cai, Leung, and Hishamunda 2009), and revealed comparative advantage (RCA) approaches (Masters and Winter-Nelson 1995;); and simpler methods such as comparison of local production costs to retail or port (World Bank 2013; Akramov and Malek 2012; Winter-Nelson and Aggrey-Fynn 2008;), benefit-cost ratio or profit margins (Ragasa et al. 2014; Ragasa et al. 2018), and input price to output price ratios (Ragasa, Chapoto and Kolavalli 2014). The RCA approach relies on the revealed concentration of economic activity in a country as an indication of the relative strength of comparative advantage in that sector. In other words, applying the RCA framework to this research, if Ghanaian producers concentrate on producing chicken, or rice, or tilapia, and if Ghana's share of the export market for those products is high relative to the export market shares for other countries, then Ghana has a strong comparative advantage in production. On the other hand, if Ghana has a low specialization in the commodities, then it has a weak comparative advantage. As explained by Cai, Leung, and Hishamunda (2009) the RCA approach is not particularly useful for evaluating *ex ante* the policy options for improving competitiveness, which is the purpose of this research.

Data on non-tradable and tradable inputs were not available in Ghana and this paper relied on past studies that looked at cost competitiveness of local production of these commodities. In particular, we compared local production costs to retail or port in Ghana and other major producing countries, based on estimates by World Bank (2013), Akramov and Malek (2012) and Winter-Nelson and Aggrey-Fynn (2008), and benefit-cost ratio or profit margins based on Ragasa et al. (2014) on determine local rice competitiveness, although there is no consideration of quality or consumer preferences. For chicken, we based the estimate and comparisons of production costs from Andam et al. (2017) for local competitiveness. For tilapia, we based the estimates and comparisons of benefit-cost ratio or profit margins and of input price to output price ratios from Ragasa et al. (2018).

Quality competitiveness

There are two main approaches for analysing consumer demand and willingness to pay for a product, namely discrete choice experiments (DCE) and experimental auctions (EA). We discuss these two approached in detail here.

Discrete choice experiments

For DCE, the theoretical framework of our analysis of consumer preferences is rooted in the Lancastrian approach to consumer theory. In a break from the traditional view that utility is derived from a good, Lancaster proposed that a good per se does not give utility to the consumer. Rather, a good possesses characteristics, and these characteristics give rise to utility. Furthermore, Lancaster generalized that goods can possess multiple characteristics which can be shared by multiple goods and that goods in aggregate can possess characteristics different from those pertaining to the goods separately (Lancaster 1966). In the present context, chicken, rice, and tilapia, the goods of interest, can be viewed as a collection of informational attributes such as certifications, country of origin, freshness, and price. Following Lancaster, a consumer with preferences over each of the characteristics will choose the bundle of attributes of the good that maximizes the consumer's utility subject to a budget constraint.

DCE closely simulate real-world purchasing decisions where a consumer must select a product from a set of options. Several studies have documented the advantages of using choice experiments over other revealed preference experimental methods, including its conformity to random utility theory and Lancaster's approach to consumer theory (Lusk and Shogren 2007;Carlsson, Frykblom, and Lagerkvist 2007). In addition, various studies have found no statistically significant difference between the results obtained from choice experiment (stated preference) data and those from actual (revealed preference) data (Adamowicz et al. 1998; Carlsson and Martinsson 2001). Researchers have also shown that using a cheap talk script as an introductory statement before starting the interviews helps to frame respondents' mind to translate the hypothetical scenarios to real-live decisions and reduces hypothetical bias (see Cummings and Taylor 1999). The cheap talk script emphasizes the importance of the study and the need to focus on budget constraints (see Annex 1 for the cheap talk script used in this study).

DCE assume that individual *n* obtains utility [U_{nit}] from selecting alternative *i* from a finite set of *J* alternatives contained in choice set *C* in situation *t*. Utility is composed of a deterministic component [V_{nit}] which depends on the attributes of an alternative and a stochastic component [e_{nit}].

The utility of alternative *i* can be specified as

$$U_{nit} = V_{nit} + \varepsilon_{nit}$$

Therefore, individual *n* will choose alternative *i* if $U_{nit} > U_{njt}$, $\forall j \neq i$. Consequently, the probability of individual *n* choosing alternative *i* is given by

$$P_{nit} = P\left[\left(V_{nit} + \varepsilon_{nit} \geq V_{njt} + \varepsilon_{njt}\right);\ \forall j \in C, \forall j \neq i\right]$$

Unlike the traditional logit model where consumers are assumed to be homogeneous, heterogeneity in consumer preferences for food attributes is measured using a latent class model (LCM). LCM is being increasingly used in applied economic research as an approach to account for differences in consumer preferences (Tonsor, Olynk, and Wolf 2009).

The deterministic component of utility [V_{nit}] in the random utility model (RUM) takes the form of

$$V_{nit} = \beta' X_{nit}$$

where β' is a vector of random parameters, which has its own mean and variance, representing individual preferences, and X_{nit} is the vector of attributes found in the *i*th alternative (in our study, X_{nit} are country-of-origin, freshness, food safety certification systems (HACCP and antibiotic-residue-free), and price for chicken and tilapia; and country-of-origin, grade, branding and labelling, and price for rice). Following Train (2003), the probability that individual n chooses alternative *i* from the choice set *C* in situation *t* is given by

$$P_{nit} = \int \frac{\exp(V_{nit})}{\sum_j \exp(V_{njt})} f(\beta) d(\beta)$$

where we can specify the distribution of the random parameter *f(.).* If the parameters are fixed at β_c (non-random), the distribution collapses, i.e. $f(\beta_c) = 1$ for $\beta = \beta_c$, and 0 otherwise.

Alternatively, heterogeneity in preferences can be assumed to occur discretely using a latent class approach where the N individuals are sorted into *S* latent classes, each composed of homogeneous consumers (Boxall and Adamowicz 2002). In the latent class logit model, *f(β)* is discrete, taking *S* distinct values (Train 2003). The probability that individual n selects option *i* in a given choice situation *t* unconditional on the class is represented by

$$P_{nit} = \sum_{s=1}^{S} \frac{\exp({\beta_s}' X_{nit})}{\sum_j \exp({\beta_s}' X_{nit})} R_{ns}$$

where β_s is the specific parameter vector for class *s*, and R_{ns} is the probability that consumer *n* falls into class s. This probability can be modeled as follows (Ouma, Abdulai, and Drucker 2007):

$$R_{ns} = \frac{\exp({\theta_s}' z_n)}{\sum_r \exp({\theta_s}' z_n)}$$

where z_n is a set of observable characteristics that affect the class membership for consumer *n*, and θ_s is the parameter vector for consumers in class *s*.

The data was effects coded to eliminate confounding effects between the constant and the attributes (Bech and Gyrd-Hansen 2005). An opt-out variable serves as a constant in our models. The LCM specifications were estimated using Stata software. In the LCM, four respondent

classes were identified as optimal using both the Akaike and Bayesian Information Criteria. The parameter estimates from the LCM models provide little economic information given the non-cardinal nature of utility. Consequently, these results are used to obtain a WTP measure, which is given by:

$$WTP_k = -\frac{\beta_k}{\beta_p}$$

where WTP_k is the willingness-to-pay for the kth attribute, β_k is the estimated parameter of the kth attribute, and β_p is the estimated price coefficient. There are different WTP estimates for each shopper class. Ninety-five percent confidence intervals for the WTP estimates were created using a parametric bootstrapping technique proposed by Krinsky and Robb (1986). A distribution of 1000 observations for each WTP estimate was simulated by drawing from a multivariate normal distribution parameterized with the coefficient and variance terms obtained from the models. This method produces results analogous to estimating a standard error using the delta method, although it relaxes the assumption that WTP is symmetrically distributed (Hole 2007).

Experimental auctions

In addition to choice experiments which yield *stated* preference information, experimental auctions (EA) have become an important tool for estimating *revealed* preferences of consumers and a more direct way of estimating WTP (Waldman, Kerr, and Isaacs 2014; Demont, Rutsaert, Ndour, Verbeke, et al. 2013; Banerji et al. 2013; De Steur et al. 2012; Demont et al. 2012). Unlike DCE, EA are incentive compatible and avoid the problem of hypothetical bias associated with stated preference techniques (Lewis, Grebitus, and Nayga 2016). EA provide a real purchasing situation, where participants find themselves in an active market environment and real goods are exchanged for real money. Thus, participants are incentivized to reveal their true willingness to pay (Lusk 2003).

EA are either conducted with individual subjects or in groups. In urban areas where the population is not dispersed, such as this study, group auctions are more convenient (Demont 2013; Lewis, Grebitus, and Nayga 2016). For this study, we conducted EA in groups with multiple rounds of bidding, and within-subject treatments of sensory evaluation to elicit WTP values contingent on each participant's taste and preference at the time of the experiment (such as those conducted by Demont, Rutsaert, Ndour, and Verbeke 2013; Lewis, Grebitus, and Nayga 2016; Lusk, Feldkamp, and Schroeder 2004; Waldman, Kerr, and Isaacs 2014). While auctions conducted over multiple rounds enable participants to exhibit rational behavior in consonance with economic theory, by providing market feedback triggered by posting prices at the end of each round, the problem of bidder affiliation ensues that may bias the succeeding bids (Lusk 2003, Harrison, Harstad, and Rutström 2004). Many studies have employed the strategy of sealed bids to surmount the problem of bidder affiliation. List (2002) found that the valuation of goods differed significantly depending on whether they were valued together or separately. Valuations of alternative goods together is therefore an efficient approach in determining WTP differences (Demont, Rutsaert, Ndour, and Verbeke 2013) and are adopted in this study.

4 Data Sources and Methods

The data are derived from two related field experiments conducted in Accra. First, we conducted discrete choice experiments (DCE) in open-air markets, supermarkets, shops, live chicken markets, and tilapia outlets in June 2018. Second, we conducted experimental auctions (EA), coupled with sensory evaluation, in selected locations in September 2018. The experiments were combined with surveys on consumption habits, perceptions, and demographic characteristics.

Discrete choice experiments

We conducted DCE during consumer exit surveys of 1,203 consumers consisting of 403 chicken shoppers, 400 tilapia shoppers, and 400 rice shoppers. The research team carried out a preliminary scoping visit to identify all major markets and major sales outlets. Annex Table 3 gives details on the total number of sampled respondents from each type of market for each product. Enumerators used a shopper-intercept sampling procedure, approaching each shopper in turn, and upon completion of the interview, moving on to the next available shopper.

We offered products at different price levels with permutations of four attributes for chicken and tilapia, namely country of origin, HACCP certification, antibiotic-residue-free certification, and freshness and three attributes for rice, namely country of origin, grading, and branding (Table 2). The attributes were selected based on preliminary studies and interviews with key value chain actors. We pretested the questionnaire and choice sets in two different markets, and we used prevailing market prices in calibration of price ranges.

Table 2. Attributes of chicken, rice, and tilapia used in the choice experiment

Product	Chicken (cut thigh parts)	Tilapia (whole, Regular-sized)	Rice (long grain, aromatic, white)
Country of origin	• Ghana-produced • Imported	• Ghana-produced • Imported	• Ghana-produced • Imported
Freshness	• Fresh • Frozen	• Fresh • Frozen	
Food safety system	• HACCP-certified • No claim	• HACCP-certified • No claim	
Test for antibiotic residue	• Antibiotic residue-free • No claim	• Antibiotic residue-free • No claim	
Grading			• Grade A (100% long and slender) • Grade B (5% broken) • Grade C (50% broken)
Branding and labelling			• Branded and labelled • Unbranded, unlabeled
Price range (GHS/kg)	8-30	6-25	15-45

Source: Authors.
Note: Photos and illustrations were used in the actual survey. These attributes, including the range of possible prices, were selected based on in-depth interviews with consumers, traders, and government officials.

For chicken and tilapia, a full factorial experimental design which includes all possible combinations of the four attributes at two levels, and six levels of price, and with two alternatives to choose between would require the use of $((2^4)(6^1))^2$ or 9216 choice sets. For rice, the combinations would require $((2^4)(7^1))^2$ or 3136 choice sets. Since it is not practically feasible to work with this many choice sets, we used a fractional factorial design implemented with sawtooth software (SSI) to obtain eight choice scenarios and D-optimal design that allowed for the estimation of all main effects. We also included an optout (no purchase) choice. SSI includes a computer-assisted personal interview (CAPI) application to understand consumers preferences and to predict choices through the choice-based conjoint analysis module. SSI allows respondents to be presented with multiple product scenarios with attributes. SSI has been increasingly used in choice experiment design (Kowalewski, Mclennan, and Mcgrath 2011; Rudd 2011).

The survey consisted of face-to-face interviews which lasted about 15 minutes each. The survey instrument had three parts. The first section was the choice experiment, with an information treatment randomly assigned to half of the respondents. The second section asked questions about general respondent consumption habits, knowledges and perceptions of specific products. The third section provided information on the socio-demographic characteristics of the respondents. The introduction to the choice experiment had an information treatment and a "cheap talk" script (Annex 1).

Experimental auctions

The second field experiment was a combination of experimental auctions (EA) and sensory evaluations of rice and chicken brands with 119 participants. The team conducted 12 auctions with a session each in the morning and afternoon of 6 days. For each session 10 participants were randomly selected from a list of recruited participants and invited for the auction[6]. The study recruited participants across three main income groups (i.e. low-income, middle-income and high-income). A short questionnaire was administered at the beginning of each auction to elicit information on socio-demographic characteristics.

We identified rice and chicken brands through market surveys, stakeholder and key informant interviews. We selected local brands that are comparable with the most popular imported rice and chicken brands in terms of packaging, branding, and product quality. For rice, we selected three local brands (Aduanehene, Royal Farmers, and DUQ)[7] and three imported brands (Gino, Royal aroma, and Millicent). We used a 5-kg package of each rice brand for the experiment since that is the most commonly packaged volume. For chicken, one kilogram, we selected two local brands, namely Aglow Farms brand and a generic option of chicken from local

[6] The details of the recruitment are presented in the appendix. In one neighborhood (Cantonments 1) only seven participants showed up. We replaced two of these three participants by inviting one more participant from two similar EAs.

[7] For the final experiment, Aduanehene and Royal Farmers were replaced with Champion rice and Copa which are both high quality local branded rice from Ghana. The replacement was necessary due to the shortage of Aduanehene and Royal Farmers in the market and provides further anecdotal evidence of the limited or seasonal availability of branded local products.

farms around Accra, and three imported chicken brands from Brazil, the Netherlands, and the United States (USA).

During the auctions, participants were required to purchase the products won during the bidding process (De-Groote et al. 2016). This was to preserve the incentive-compatible property of the auction mechanism throughout the experiment. We used the Vickrey (1961) third price auction mechanism (Demont et al. 2013; Waldman, Kerr, and Isaacs 2014; Banerji et al. 2013; De Steur et al. 2012; Demont et al. 2012). With the Vickrey (1961) third price auction mechanism, the top two bids are displayed at the end of every round as winners and the corresponding bidders pay the third highest bid as the "market price" for the good. To avoid a situation where one participant wins more than one product, only one round and one product was randomly selected as binding after bidding for three-rounds (Waldman, Kerr, and Isaacs 2014; Demont et al. 2013).[8]

At the beginning of the auction, we informed participants that they would receive a participation fee. They were reminded that the participation fee was to cover the transportation costs to attend the auction. We were careful to clarify this information, to avoid participants viewing the participation fee as a reward or payment for service for which they would have to reciprocate, since that could lead to bias in bids (Lusk and Shogren 2007; Loureiro, Umberger, and Hine 2003; Demont, Rutsaert, Ndour, and Verbeke 2013). Participation fees typically have no impact on willingness to pay (Banerji et al. 2013; De Steur et al. 2012). The participation fee was just enough for participants to be able to make at least one purchase of a preferred item being auctioned, based on the prevailing market price for 5 kilograms of imported rice and 1 kilogram of chicken.

Before the auction, we trained participants using common brands of biscuit. We chose biscuit because it mimics quite closely our scenario of local versus imported food products, and we used a local biscuit and an imported biscuit brand. For the training session we used the analogy of bidding for food products in a church or community fund-raising event, a widespread practice in Ghana, to aid the participants' understanding of the Vickrey (1961) third price mechanism. Following (Lusk, Feldkamp, and Schroeder 2004), we conducted simultaneous auctions for chicken and rice respectively. The experiments employed a direct bidding approach where respondents directly submitted sealed bids on each of the six rice brands and five chicken brands. Simultaneous bidding is an efficient approach to estimating willingness to pay differences (Alfnes and Rickertsen 2005). The research team thoroughly explained all the details of the auction mechanism to the participants before the auction. The auctions were conducted in English and translated into two local languages, *Twi* and *Ga,* when necessary. During the experiment we did not discuss the government's goals of increasing the competitiveness of local products, since this may have resulted in social desirability bias.

[8] Winning more than one product could result in demand reduction where participants submit lower bid values in subsequent rounds due to the fear of wining more than one product which requires them to make payment for all (Lusk 2003).

Descriptive statistics

The two field experiments yielded data from 1,322 consumers of varied income groups and locations in Accra. Descriptive statistics of selected demographic variables are presented in Table 3. The mean age of participants was 38 years, and nearly 80 percent were female. Ten percent did not receive formal education and the majority have secondary education or less. The majority are self-employed. The majority are non-poor: about 10 percent are in the poor group (<400 Ghana cedis or USD83 income per month), 66 percent are in the middle income (400 to 2,000 Ghana cedis or USD83-415 per month), and 23 percent are in the rich group (>2,000 Ghana cedis or USD415 per month).[9] The mean weekly food expenditure was 200 Ghana cedis or USD40/week or USD6-7/day. Compared with nationally-representative socio-demographic data from the Ghana Living Standards Survey round 6 (GLSS6 2012/2013) and the Ghana Demographic and Health Survey (DHS 2014), the participants were generally representative of Ghana's urban population, with the only one notable exception that the share of female respondents was 79 percent, higher than the national statistic of 52 percent female in the population. This reflects the fact that in Ghana shopping for food is predominantly carried out by women.

Table 3. Descriptive statistics

	All	Chicken	Rice	Tilapia
Sample size	1322	523*	520*	400
Age Mean (SD)	38.40	37.60	39.68	37.80
	(11.66)	(11.73)	(12.37)	(10.47)
Gender (%)				
Male	21	23	19	20
Female	79	77	81	80
Level of formal education (%)				
Primary	12	10	11	14
Junior secondary education	31	29	33	31
Secondary education	28	31	27	24
Post-secondary	8	8	7	8
Bachelor's degree	10	11	9	10
Master's or higher degree	2	2	2	2
Employment status (%)				
Full-time employed	24	32	23	14
Part-time employed	3	3	3	2
Self-employed	62	53	59	76
Unemployed	5	7	6	3
Retired	2	3	1	3
Household duties (Homemakers)	1	0	3	1
Student	2	2	3	1
Income group (%)				
GHS < 400 (Poor)	10	11	10	9
GHS 400 to < 1,000 (lower middle)	39	41	27	54

[9] These categories of poor, middle-income, and rich are based on key informants' views of relevant income categories for households in Accra. We used this instead of the official poverty thresholds, which would require detailed consumption data that were not collected in this survey.

	All	Chicken	Rice	Tilapia
GHS 1,000 to < 2,000 (upper middle)	29	31	27	27
GHS 2,000 to < 3,000 (rich)	12	12	18	4
GHS 3,000 to < 4,000 (rich)	6	4	11	4
GHS 4,000 and above (rich)	4	2	6	2
Household size mean (SD)	4.41	4.38	4.43	4.44
	(2.27)	(2.47)	(2.13)	(2.18)
Weekly food expenditure mean (SD)	199.78	195.29	208.86	194.01
	(153.31)	(140.15)	(175.39)	(138.56)

Source: Discrete choice experiments and experimental auction surveys (2018).
Note: *Same respondents for chicken and tilapia during the auction. SD=standard deviation

Consumers consume the three products frequently. Three-quarters of respondents eat rice more than once a week, and 20 percent eat rice every day (Table 4). About 60 percent and 70 percent eat chicken and tilapia respectively at least once a week. Rice is also frequently eaten outside home. More than half of the respondents eat rice away from home at least once a week. On the other hand, consumers tend to eat chicken and tilapia at home rather than away from home: 55 percent of respondents never tilapia outside their home.

Table 4. Percentage of consumers consuming chicken, rice and tilapia

Frequency of consumption:	At Home (%)				Outside Home (%)			
	Chicken	Rice	Tilapia	Total	Chicken	Rice	Tilapia	Total
At least once a day	10	20	8	13	4	11	2	6
More than once a week	25	55	18	34	14	36	2	18
About once a week	24	16	44	27	7	17	9	11
A few times a month	15	3	11	9	17	13	10	13
About once a month	22	4	13	13	13	6	6	8
A few times a year	4	1	4	3	18	10	17	15
Never	0	0	1	0	27	8	55	28

Source: Discrete choice experiments and experimental auction surveys (2018).

5 Results and Discussion

We begin with the self-reported criteria for consumer choices. This provides a ranking of the traits and characteristics of products that consumers look for when purchasing the products and serves as the point of departure for the remainder of the analysis. We then look at the market prices and production costs of the products as a partial answer to the question of the extent to which local producers can compete on price. After assessing price competitiveness, we focus on quality competitiveness with three analytical findings from the choice experiments: consumer perceptions of local versus imported products, ratings and WTP for products, and determinants of WTP levels.

Product attribute demand

Figure 2 depicts the rankings of product attributes by respondents. Freshness is the main attribute demanded by most chicken and tilapia respondents, while and price and size are second and third main attributes considered across all income groups. The next highest ranked attributes are price and size. For rice, experience attributes such as aroma and taste were the main attribute

demanded by respondents, followed by price. Figure 1 provides some insights on the level importance of the local versus import issue for consumers. Evidently, in terms of attribute demand, consumers care less about 'localness' or 'foreignness' of products, and more about quality and price.

For chicken and tilapia, however, the fact that freshness is the most important attribute gives an indication that local products could be competitive because producers have a natural advantage in terms of the timing from farm to market. In other questions about perceptions of products, reported below, the respondents generally have a higher perception of local products compared with imports, in terms of meeting nutritional and food safety preferences. For rice, the importance of aroma and fragrance in these rankings adds to the existing evidence that urban consumers in West Africa prefer fragrant rice (Diagne, Demont, and Ndour 2017). This preference may be one of the factors driving the lack of competitiveness of local rice, even when it sells at a lower price than imported rice. However, there is conflicting evidence on this point, because some local brands are aromatic, and therefore purity of the product may be more important. In the next sections we examine these issues in more detail.

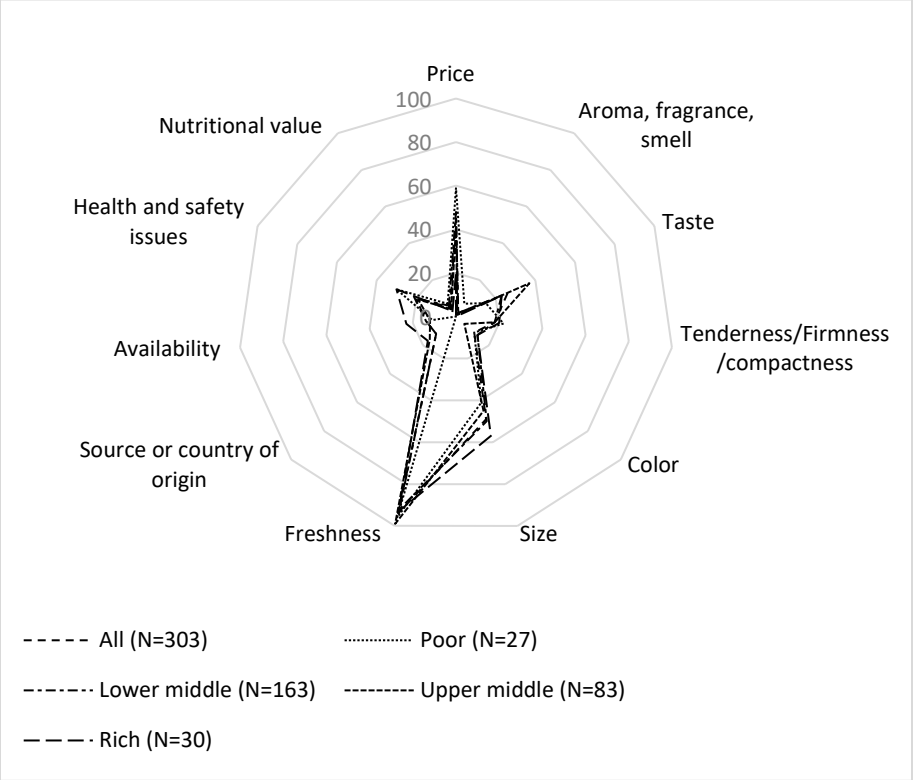


Figure 2(a) Tilapia attribute demand by income group (% of respondents)

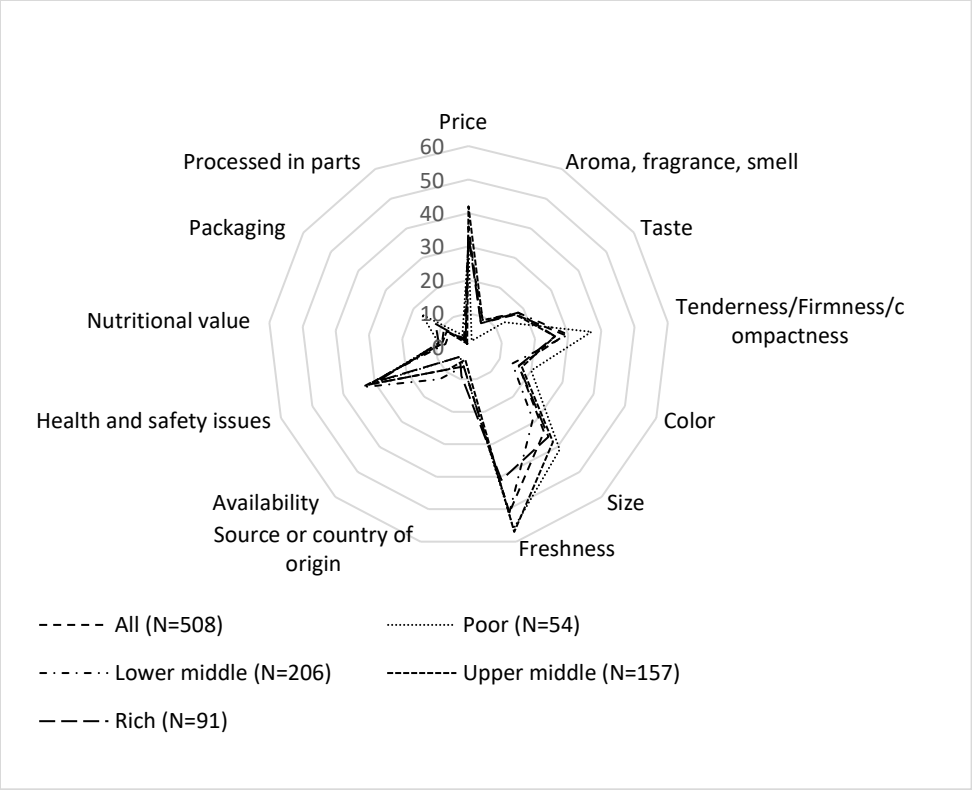


Figure 2(b) Chicken attribute demand by income group (% of respondents)

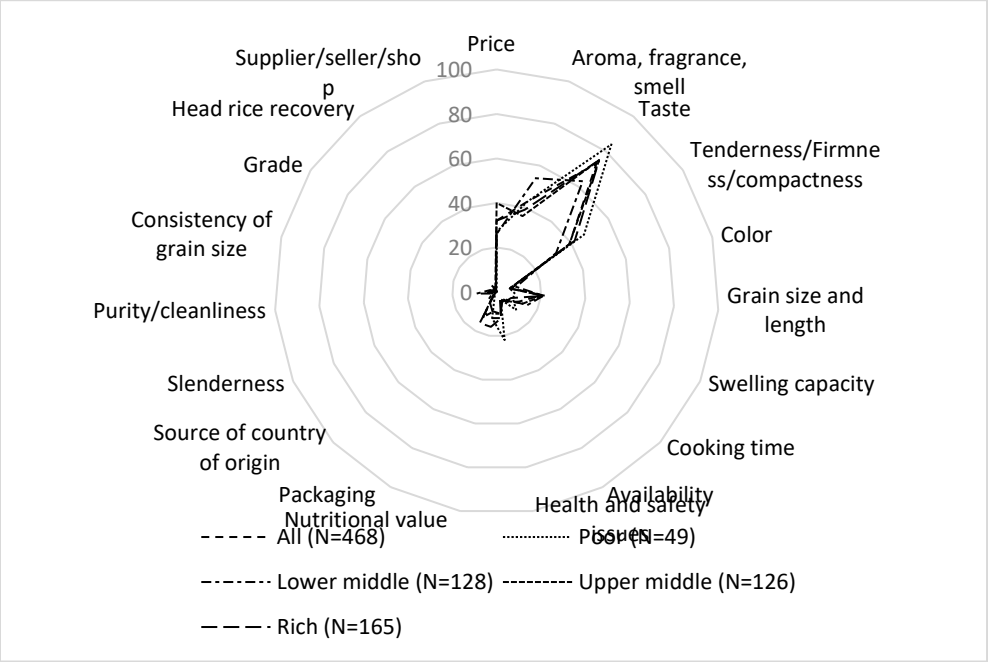


Figure 2(c) Rice attribute demand by income group (% of respondents)

Figure 2. Product attribute demand by income group

Source: Discrete choice experiments and experimental auctions data (2018).

Price competitiveness

In this section we compare prices for local and imported products and compare production costs in Ghana to those pertaining in comparative countries. As noted above, price is the second top criterion in consumer purchasing decisions, and this particularly important for poorer households. For all three products, we use secondary data to provide an assessment of the price competitiveness of local production against imports.

For chicken, while farm production costs are estimated at USD 1-1.5 per kilogram in efficient production systems in Brazil and the USA, in Ghana the production costs are more than twice as high (Andam, Johnson, et al. 2017). Processing and packaging costs are also likely to be higher in Ghana since Ghana's broiler industry has not yet adopted the vertically-coordinated production systems that have led to cost-reductions in other countries (Andam, Johnson, et al. 2017). Chicken from local farms is mostly sold either as live birds or dressed *in* situ in local markets, and there is limited capacity for processing broiler chickens on a commercial scale (Andam, Johnson, et al. 2017). At the time of the study there was only one chicken processing plant operating in Accra, processing about 100 birds per day from farms around the country. The cost of processing broiler chickens into dressed whole or packaged parts at this plant was about 40 percent higher than the average costs of processing broilers in the EU reported by Van-Horne and Bondt (2013). Mostly due to the comparatively higher costs of farm production and processing in Ghana, imported chicken, even with the storage and transportation costs of deep-sea shipment, consistently sells at a lower price than local chicken (Table 5).

Table 5. Retail prices of chicken

	Chicken part				
	Whole dressed chicken (GHS)	Breast (GHS per kilo)	Wings (GHS per kilo)	Thighs (GHS per kilo)	Gizzard (GHS per kilo)
Locally produced chicken	35	13	14	14	10
Imported chicken	25	10	12	10	8

Source: IFPRI market interviews (2016)

Despite the lack of price competitiveness, there seems to be a small niche for local products, because the chicken market is clearly segmented into a market for imported cut frozen chicken and a market for local chickens sold as live birds. Key informants indicated that local chicken is tastier, and many Ghanaians perceive that local meat is healthier and safer for consumption because it contains lower amounts of chemicals and hormone additives (see findings below on perceptions of local versus imports). However, in market surveys, the research team found only one branded local chicken product (Aglow), although some key informants mentioned that other brands are available intermittently, and an inventory of chicken products in Accra and other cities found very few local brands (Andam et al. 2018). Thus, the niche for local chicken is filled mostly through the live bird markets.

For rice, imported products generally command a 30 percent premium compared to local rice. The price variations in the rice market are mainly attributed to quality, origin, type of rice and location of the market (Ayeduvor 2018; Ragasa et al. 2014). Local branded white rice is sold for GHS5 to GHS8 per kilogram compared to the generally higher price of imported rice between GHS7 and GHS10 (Ayeduvor 2018).

Unlike chicken, where there seems to be a clear connection between the high production and processing costs in Ghana and the comparably higher price of local products when compared to imports, the lower price of local rice products are not matched by lower production costs in Ghana. Ragasa et al. (2014) compared rice production and marketing costs in Ghana to costs in Senegal and Thailand. Seasonal land preparation and crop establishment, which mainly involves mechanization and labor cost, ranges from USD 62-105 per metric ton of paddy in Ghana compared with USD 31-36 in Senegal and USD 16-21 in Thailand. Milling losses are much higher in Ghana and the milling costs (in USD per MT of milled rice) are also significantly higher in Ghana than in Senegal or Thailand. Aside from milling, there are no available data on other local processing costs for rice. While it may be possible, but implausible, for processing costs to be much lower in Ghana than in East Asia, a more likely explanation for the lower price of local branded rice compared to imports is that imported rice attracts a premium for its foreignness or perceived quality. In the analysis that follows we test this hypothesis.

For tilapia, we cannot compare retail prices of local and imported products, due to the de facto ban on imports. Ragasa et al. (2018) found little evidence of the presence of imported tilapia in markets in Accra, although key informants' interviews suggest imported tilapia are seasonal and are often priced 30 percent lower than local tilapia. Local tilapia production, at least for cage culture, is profitable, with similar profit margins or benefit-cost ratios of 27-39 percent as in other major-producing countries (China, Bangladesh, and Egypt). Feed conversion ratio, which is a major indicator of production efficiency and competitiveness in the aquaculture sector, is comparable with other major producing countries. Tilapia price is high in Ghana, thrice more expensive than a close substitute animal protein, which is chicken, and twice higher than other major producing countries using a simple USD-conversion. However, the costs of production to retail market are 70 percent higher compared to production in those other countries. Tilapia production costs in Ghana are in the range of USD 1.40 to 2.40 to produce 1 kg of tilapia, compared with international figures of USD 0.78 to 1.29 (Ragasa et al. 2018). The main difference in costs is cost of feeds, which comprise of 80 percent of total tilapia production costs. Feed costs in Ghana are almost twice higher than Bangladesh, China, and Egypt, which have more established and mature feed sector. Feed price to tilapia price ratio is 0.33 – 0.40, similar range as in China and Egypt, but much higher than Bangladesh. The difference in production costs suggests that in the future there could be competition from imports, either brought into Ghana illegally, or if the government were to lift the import ban and allow cheaper imported tilapia onto the market.

Quality competitiveness

Perceptions of local versus imported foods

For chicken, most respondents buy both local chicken and imported chicken. During their latest purchase, 21 percent of respondents reported buying local chicken while the rest bought imported chicken. Among those buying imported chicken, 24 percent of respondents could tell the country-of-origin (mainly Brazil and European countries), 10 percent knew chicken bought was imported but they did not know the country of origin; and about half of consumers did not know whether local or imported (but key informants and shopkeepers indicated these were generally imported).

There seems to be more favourable perception of local chicken and tilapia compared with imported products in terms nutrition, food safety and taste, but local rice does not seem to have a similar favourable impression when compared with imported rice (Table 6). While at least 60 percent of chicken and tilapia respondents strongly perceive local chicken and tilapia to be more nutritious and safer to eat than imported counterparts, only 30-44 percent of rice respondents have a similar view of local rice. Only 22 percent of rice respondents strongly perceive local rice to be tastier than imported rice, while 34 percent perceive that imported rice is tastier than local rice. These impressions of imported rice among Ghanaian consumers have also been observed in other West African cities (Demont, Fiamohe, and Kinkpé 2017).

The availability of local products in shops seems to be a major issue especially for local processed chicken (Table 6). For rice, while unlabelled and unbranded local rice is available in local markets, locally-branded and packaged rice is relatively unknown to respondents. Thus, for packaging, branding and marketing or promotion seem to be a challenge for the local chicken and rice industries.

Table 6: Perceptions of local and imported chicken, rice and tilapia (percent of respondents)

	All (%)	Chicken (%)	Rice (%)	Tilapia (%)
Locally produced chicken/rice/tilapia is more nutritious than imported chicken/rice/tilapia				
Strongly disagree	1	1	2	1
Disagree	6	5	11	1
Agree	35	27	43	33
Strongly agree	58	67	44	65
Locally produced chicken/rice/tilapia is tastier than imported chicken/rice/tilapia				
Strongly disagree	5	1	10	3
Disagree	17	4	34	13
Agree	33	26	34	43
Strongly agree	45	70	22	41
Locally produced chicken/rice/tilapia is harder to find in shops than imported chicken/rice/tilapia				
Strongly disagree	4	1	11	1
Disagree	11	4	27	1
Agree	28	19	30	38
Strongly agree	56	77	32	60

Source: Discrete choice experiments and experimental auctions data (2018).

Consumer ratings, WTP, and actual prices of local versus imported foods

For rice, the auction results are generally consistent with the market trends in terms of consumer preference and WTP for the imported brand Gino (Table 7), based on their slender grains and aromatic qualities. In contrast, the three local brands have unpolished, chalky appearance of their grains that consumers did not prefer. This may have to do with seed varieties, production patterns, and processing techniques in the local value chain.

Nonetheless, a few respondents prefer local brands. Champion seems to be the most preferred of the local brands (16 percent of respondents indicated this as their best brand); followed by Copa (12 percent of respondents), and Duq (8 percent of respondents). The former two seem to be able to compete in terms of appearance, taste and overall acceptability with some imported brands, such as Millicent and Royal Aroma, but not with the highest-quality ones (Gino). In fact, the local brand Champion received higher ratings and WTP values than the two imported brands Millicent and Royal Aroma. This shows some potential for local brands to compete.

Table 7 shows that there is a larger difference between actual prices and bids for imported rice than for local rice. If we assume that market prices are generally higher than bids in experimental setting, these differences in prices may indicate even greater potential for local prices to eventually fetch higher market prices in the future if extensively promoted.

Table 7. Comparison of auction bids and market prices

Product	Description	Most preferred brand (% of respondents) *	Auction bids (WTP)			Actual prices in shops	Difference (Actual-Bid)
			Mean	Median	Std. Error (mean)		
Copa (local)	100% long grain; slender; unpolished and chalky	12	28.42	28.00	0.45	30.00	1.58
Royal Aroma (imported)	100% long grain; slender; polished and bright white	6	28.99	28.00	0.43	34.00	5.01
Gino (imported)	100% long grain; very slender; polished and bright white	53	36.19	35.00	0.51	43.00	6.81
Champion (local)	100% long grain; slender; unpolished and chalky	16	31.49	30.00	0.50	33.00	1.51
Millicent (imported)	100% long grain; slender; polished and bright white	14	30.90	30.00	0.44	34.00	3.10
Duq (local)	10-15% broken long grain; slender; unpolished and chalky	8	27.60	27.00	0.45	30.00	2.40
All			30.60	30.00	0.20	34.00	3.40

Source: Discrete choice experiments and experimental auctions data (2018).
Note: *The actual question asked after tasting and rating was: "Which of the samples do you like best?" Ratings for specific traits or characteristics are available in Annex Table 1.

A simple comparison of WTP for local and imported rice shows that imported rice overall has higher WTP through auction by 9 percent and higher market prices by 16 percent than local rice (Table 8). This is largely driven by Gino, which is far more expensive than the other brands. If we exclude Gino, imported rice has higher WTP through auction by 2.6 percent and market prices by 3 percent than local rice, but no statistical difference across these brands. Based on the discrete choice experiment (DCE), there is no difference between WTP for local versus imported rice (Tables 7, 8). Altogether, these results consistently show similar WTP for local rice and imported rice, excluding Gino.

In Table 9 we compare WTP by respondent class. WTP for local rice is 0.3 percent of imported rice overall, although this varies by type or class of respondents from negative WTP of 2-12 percent (for imported rice lovers and labelling conscious) to positive WTP of 4 percent (for lovers of local rice) (Table 9). While overall WTP for labelling and grading is generally low (less than 1 percent), WTP by labelling conscious respondents for branded and labelled rice is 56 percent of unbranded and unlabelled rice. Their WTP for Grade A (100% long and slender grains) is 31 percent of Grade C (50% broken grains).

Table 8. Difference between stated WTP and actual market prices of rice

Country-of-origin	Price/bid (Ghana cedis) or *WTP (%)*
Experimental Auctions (EA)	
Local	29.17
Imported	32.03
Imported (excluding Gino)	29.95
WTP for local versus imported (%)	*-8.92*
WTP for local versus imported (excluding Gino) (%)	*-2.59*
Discrete Choice Experiments (DCE)	
WTP for local versus imported (%)	*0.30*
Actual	
Local	31.00
Imported	37.00
Imported (excluding Gino)	32.00
Actual difference between local and imported (%)	*-16.22*
Actual difference between local and imported excluding Gino (%)	*-3.13*

Source: Data from discrete choice experiments and experimental auctions (2018)

Table 9. WTP for rice traits by different shopper class

Traits	Random Utility Model	Class 1 "Lovers of imported rice" (13%)*	Class 2 "Grading conscious" (18%)	Class 3 "Lovers of local rice" (22%)	Class 4 "Labeling conscious" (10%)	Class 5 "Price conscious" (37%)
Ghana-grown	0.32 *[0.24-0.36]*	-2.68 *[-1.12 to -3.38]*	0.7 *[0.621-0.931]*	4.33 *[3.92-5.35]*	-12.1 *[-8.21 to -14.934]*	0.05 *[0.04-0.06]*
Branded and labelled	0.59 *[0.27-0.78]*	0.49 *[0.37-0.52]*	1.49 *[1.310-1.684]*	0.22 *[0.12-0.29]*	56.06 *[54.72-58.88]*	0.32 *[0.25-0.39]*
Grade (control=Grade C [50% broken grains])						
Grade A (100% long/slender)	0.87 *[0.57-0.108]*	0.3 *[0.11-0.53]*	12.50 *[10.43-14.22]*	0.66 *[0.57-0.73]*	31.01 *[30.72-32.77]*	0.18 *[0.16-0.20]*
Grade B (5% broken grains)	0.36 *[0.27-0.58]*	0.15 *[0.13-0.19]*	5.83 *[5.64-5.93]*	-0.25 *[-0.15 to -0.35]*	14.45 *[13.82-16.03]*	0.10 *[0.09-0.11]*

Source: Discrete choice experiments and experimental auctions data (2018).
Note: *Predicted class size or proportion of respondents in each class. Figures in brackets are the 95% confidence interval estimates.

For chicken, the auction results are generally consistent with the market trends in terms of consumer preference and WTP for local fresh chicken (Table 10). Local fresh chicken has the highest actual price in the markets and stated WTP from respondents. The local processed chicken fetched higher WTP than the imported ones, but the difference in WTP and market price is highest for local processed chicken. In terms of overall ratings of the brands, the respondents are distributed across the brands, with slightly greater proportion of respondents strongly liking imported chicken from USA followed by local processed and local fresh chicken.

In contrast to the rice bids, the chicken bids are generally higher than the actual prices in the market. There are some possible explanations for this. For example, participants may be more familiar with the market prices for rice, as a staple, than for chicken, which is more of a higher-end product, and therefore they offered bids closer to, or below market price, for rice. There is not much distinct differentiation and advantage of local processed chicken over imported chicken, which is reflected in the small difference in prices. For local chicken producers, this implies that processing costs should be kept as low as possible in order to compete against imports.

Table 10. Average WTP for selected chicken products based on experimental auction

Product	Most preferred brand (% of respondents)*	Auction bids (WTP)			Actual prices in shops	Difference (Actual-Bid)
		Mean	Median	Std error (mean)		
Local fresh	26	17.19	15.00	0.42	16.00	-1.19
Imported from Brazil	19	15.13	14.00	0.35	12.00	-3.13
Imported from Holland	19	15.13	13.00	0.37	9.80	-5.33
Imported from USA	36	15.42	13.00	0.42	9.50	-5.92
Local processed	26	16.60	15.00	0.44	10.00	-6.60
Total		**15.89**	**15.00**	**0.18**	**11.46**	**-4.43**

Source: Experimental auctions (2018).
Note: *The actual question asked after tasting and rating was: "Which of the samples do you like best?" Ratings for specific traits or characteristics are available in Annex Table 2.

Overall, WTP for local chicken is 11-12 percent higher than WTP for imported chicken, but local chicken prices are 25 percent higher than imported chicken prices in the market (Table 11). WTP for local chicken compared with imported chicken varies from 0.3 percent for price conscious respondents to 14 percent for local chicken lovers (Table 12).

For tilapia, overall WTP for the local product is 5 percent, and ranges from 0.14 percent among price conscious respondents to 10 percent among food safety conscious respondents (Table 13).

Table 11. Difference between stated WTP and actual market prices of chicken

Country-of-origin	Price/bid (Ghana cedis) or *WTP (%)*
Experimental Auction (EA)	
Local	16.90
Imported	15.22
WTP for local versus imported (%)	*10.99*
Discrete Choice Experiment (DCE)	
WTP for local versus imported (%)	*12.00*
Actual	
Local	13.00
Imported	10.43
Actual difference between local and imported (%)	*24.60*

Source: Choice experiments and experimental auctions (2018).

Table 12. WTP for chicken by different shopper class

	Class 1 (Local chicken lovers)	Class 2 (Food safety conscious)	Class 3 (Imported chicken lovers)	Class 4 (Price conscious)
Ghana-produced	14.07	9.85	4.42	0.34
	[7.87-20.27]	[7.41-12.29]	[2.69-6.15]	[0.30-0.38]
Certified HACCP	3.31	10.66	0.08	0.14
	[2.19-4.42]	[8.12-13.21]	[0.78-0.93]	[0.10-0.18]
Certified antibiotic residue free	7.03	15.67	0.15	0.46
	[4.63-9.43]	[12.33-19.01]	[-1.24-0.94]	[0.42-0.48]
Fresh	5.97	3.00	1.46	0.20
	[3.67-8.27]	[2.26-3.74]	[0.86-2.06]	[0.18-0.22]

Source: Discrete choice experiments (2018).
Note: Figures in brackets are the 95% confidence interval estimates.

Table 13. Willingness to pay for tilapia attributes (%)

	Class 1 "Price conscious"	**Class 2 "Food safety conscious"**	**Class 3 "Local tilapia lovers"**	**Class 4 "Fresh tilapia lovers"**
Ghana-grown	0.14	9.63	4.74	2.32
	[0.12-0.16]	[8.82-10.43]	[3.92-5.35]	[1.82-2.93]
HACCP certified	0.21	12.24	0.78	0.80
	[0.17-0.23]	[7.51-18.28]	[0.62-0.86]	[0.72-0.89]
Certified antibiotic residue free	0.13	12.64	0.73	2.21
	[0.11-0.15]	[8.43-17.22]	[0.67-0.84]	[1.72-2.77]
Fresh	0.22	0.76	0.66	7.94
	[0.21-0.24]	[0.64-0.84]	[0.62-0.79]	[6.82-9.03]

Source: Discrete choice experiments and experimental auctions data (2018).
Note: Figures in brackets are the 95% confidence interval estimates.

Determinants of WTP

For rice, there is no difference between imported and local per se and therefore no evidence of significance of preference for "foreignness" or "localness" in rice. WTP is strongly dictated by appearance of the rice (Table 14, especially models 3 and 4).

Table 14. Determinants of WTP of local rice

Dependent variable = ln(WTP)	Model 1	Model 2	Model 3	Model 4
Local (=1)	-0.099***			
	(0.013)			
Brand (control=Royal Aroma[imported])				
Copa (local)		-0.028		
		(0.022)		
Gino (imported)		0.221***		
		(0.022)		
Champion (local)		0.079***		
		(0.022)		
Millicent (imported)		0.066***		
		(0.022)		
Duq (local)		-0.061***		
		(0.022)		
Physical evaluation of research team				
Polished and bright white (=1) [/a]			0.008	
			(0.015)	
100% long grain (=1) [/b]			0.087***	
			(0.019)	
Very slender grains (=1) [/c]			0.188***	
			(0.019)	
Ratings from respondents (1-9 Likert scale)				
Aroma				0.006*
				(0.003)
Appearance				0.030***
				(0.004)
Texture				-0.003
				(0.004)
Taste				-0.001
				(0.005)
Overall acceptability				0.009*
				(0.005)
Bidding done after product tasting (=1)	0.077***	0.077***	0.077***	0.081***
	(0.014)	(0.013)	(0.013)	(0.014)
Auction done in morning (=1)	0.063***	0.063***	0.063***	0.070***
	(0.013)	(0.013)	(0.013)	(0.013)
Male (=1)	-0.099***	-0.099***	-0.099***	-0.091***
	(0.015)	(0.015)	(0.015)	(0.015)
Married (=1)	-0.049***	-0.049***	-0.049***	-0.042***
	(0.014)	(0.014)	(0.014)	(0.014)
Age	0.015***	0.015***	0.015***	0.013***
	(0.003)	(0.003)	(0.003)	(0.003)
Age squared	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)

Dependent variable = ln(WTP)	Model 1	Model 2	Model 3	Model 4
Highest education level	0.019***	0.019***	0.019***	0.009
	(0.006)	(0.006)	(0.006)	(0.006)
Household size	-0.002	-0.002	-0.002	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)
Income group (control=poor)				
Lower middle	0.136***	0.136***	0.136***	0.139***
	(0.024)	(0.023)	(0.024)	(0.024)
Upper middle	0.157***	0.157***	0.157***	0.196***
	(0.025)	(0.024)	(0.024)	(0.025)
Rich	0.098***	0.098***	0.098***	0.125***
	(0.026)	(0.025)	(0.025)	(0.026)
Constant	2.955***	2.859***	2.798***	2.646***
	(0.065)	(0.064)	(0.065)	(0.073)
N	2088	2088	2088	2010
R-squared	0.104	0.167	0.154	0.131
Adj R-squared	0.104	0.167	0.154	0.131

Source: Experimental auctions (2018).

Note: significant at * p<0.05, ** p<0.01, *** p<0.001; /a Polished and bright white = imported brands (=1) /b 100% long grain = all brands except Duq /c Very slender = Gino. These show that Gino (because of its very slender grains) fletches the highest price; while Duq (because of its broken grains) fetches the lowest price, while the rest (local or imported, very polished and bright or not) seem to have similar prices.

Local fresh chicken has the highest actual price in the markets and stated WTP from respondents (Table 15). The local processed chicken fetched higher WTP than the imported ones (Table 15). In terms of overall ratings of the brands, the respondents are distributed across the brands, with slightly greater proportion of respondents strongly liking imported chicken from USA followed by local processed and local fresh chicken (see sensory evaluation results in the annex, Table A2). There seems no additional WTP for traits such as texture, taste and overall acceptability (Table 15, Models 4 and 5). While imported from USA has slightly better overall taste, texture and overall acceptability than local chicken and other imported ones, followed by local fresh and local processed chicken (see sensory evaluation results in the annex, Table A2), the differences are not statistically significant (Table 15, Model 5).

Table 15. Determinants of WTP for local chicken

Dependent variable = ln(WTP)	Model 1	Model 2	Model 3	Model 4	Model 5
Local (=1)	0.099***		0.076***		0.100***
	(0.020)		(0.025)		(0.020)
Fresh (=1)			0.047		
			(0.031)		
Product (control=local processed)					
Local fresh		0.047			
		(0.031)			
Imported from Brazil		-0.077**			
		(0.031)			
Imported from Holland		-0.082***			
		(0.031)			
Imported from USA		-0.069**			
		(0.031)			
Ratings from respondents					
Texture				-0.002	-0.001
				(0.007)	(0.007)
Taste				0.009	0.009
				(0.009)	(0.009)
Overall acceptability				0.011	0.01
				(0.008)	(0.008)
Post-tasting (=1)	0.025	0.025	0.025	0.025	0.025
	(0.020)	(0.020)	(0.020)	(0.021)	(0.021)
Morning time for auction (=1)	0.109***	0.109***	0.109***	0.103***	0.103***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Age	-0.007*	-0.007*	-0.007*	-0.007*	-0.007*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Age squared	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male (=1)	0.01	0.01	0.01	0.005	0.005
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Married (=1)	-0.008	-0.008	-0.008	-0.011	-0.011
	(0.021)	(0.021)	(0.021)	(0.022)	(0.021)
Highest education level	0.049***	0.049***	0.049***	0.049***	0.049***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Household size	0.008*	0.008*	0.008*	0.008*	0.008*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Income group (control=poor)					
Lower middle income	0.094***	0.094***	0.094***	0.098***	0.099***
	(0.036)	(0.036)	(0.036)	(0.037)	(0.037)
Upper middle income	0.104***	0.104***	0.104***	0.107***	0.108***
	(0.038)	(0.038)	(0.038)	(0.039)	(0.038)
Rich	-0.141***	-0.141***	-0.141***	-0.136***	-0.135***
	(0.039)	(0.039)	(0.039)	(0.040)	(0.039)
Constant	2.504***	2.580***	2.504***	2.407***	2.365***
	(0.099)	(0.100)	(0.099)	(0.110)	(0.109)
N	1710	1710	1710	1704	1704
R-squared	0.104	0.105	0.105	0.096	0.11
Adj R-squared	0.104	0.105	0.105	0.096	0.11

Source: Experimental auctions (2018)
Note: significant at * p<0.05, ** p<0.01

Some comparisons across products

For chicken and rice, the results confirm the dominance of imported products and countries of origin, in line with earlier market studies (Andam et al. 2018). For example, although local fresh chicken consistently has higher WTP and actual prices, imported chicken from USA had the most favourable ratings and most respondents selected it as their best brand. Other than this, we did not find strong and distinct differences between local and imported chicken. This finding, coupled with the low price-competitiveness of local products, implies that local processing costs for chicken have to be as low as possible for local processed to be able to compete against imports. Some local rice brands (particularly Champion brand) are considered a preferred brand by some consumers and therefore have the potential to compete with the lower-quality imported brands, given that better marketing and promotion of local rice brands can be done. For tilapia, local and fresh tilapia is strongly preferred and fetches positive WTP ranging from 0.14 percent to 10 percent.

The model results from Tables 14 and 15 show other interesting aspects of the factors driving WTP for the products. Participating in the auction in the morning gives higher WTP for both rice and chicken, possibly because respondents may be hungrier earlier in the day, which is a factor to consider for future experimental work. Education is consistently strongly associated with higher WTP. While age of shopper is significant in both chicken and rice respondents, very young and very old respondents have the highest WTP for chicken, while it is the opposite for rice. Household size is positively associated with higher WTP for chicken but not for rice. For chicken, middle income respondents have higher WTP than poor respondents, but the rich have lower WTP than poor, maybe because they substitute chicken with other more expensive protein sources. WTP and bidding after tasting is positively correlated for rice, not for chicken. Male and married respondents have lower WTP for rice, but not for chicken.

6 Conclusions and Policy Implications

This paper has examined the prospects for improving the competitiveness of locally-produced foods in West Africa by investigating the factors driving the preferences of consumers in Accra, Ghana for chicken, rice, and tilapia, complemented by analysis of cost and price competitiveness. Compared with similar studies on local competitiveness (Demont et al. 2017), one advantage of our multi-product approach is that our findings allow for comparisons across the products. For example, estimates suggest that about 60 percent of rice and more than 90 percent of chicken consumed in Ghana is imported. While imported chicken is generally cheaper than locally-processed chicken (by about 30-40 percent), imported rice fetches a higher price of around GHS 6-9 per kilogram (kg) compared to GHS 4-5 per kg for local branded rice. Comparing the two products, an interesting question for rice is why local brands are cheaper, and despite being cheaper, why demand for local rice is so low among urban consumers.

Our review of primary and secondary data comparing market prices of imported and local products, and cost of production in Ghana compared to major exporting countries, confirms that there is limited scope for local producers to compete on price. Production costs are higher in Ghana for all three products compared with production costs in other countries. Our research therefore focused on quality competitiveness by seeking to understand consumer perceptions of

and demand for quality attributes of local versus imported products using two related experiments – discrete choice experiments and experimental auctions – with 1,322 consumers in Accra.

To summarize our findings on quality competitiveness, consumers perceive locally produced chicken and tilapia as having better taste and nutrition than imported chicken and tilapia, but local rice does not have such a clear perception edge over imported rice. In terms of demand measured by WTP, local chicken has a higher WTP than imported chicken, but the premium, at 12 percent, likely due to this perceived better taste and safer chicken, is about half of the difference in actual market price between local and imported chicken. It is therefore clear from these assessments that the much cheaper imported chicken wins over perceived quality advantage of local chicken for most consumers. Local tilapia also commands a premium, but a more relevant finding is the importance placed on freshness, which suggests that there is a natural barrier to entry of imported tilapia on the market. For rice, appearance seems to be the major consideration of consumer demand, and not localness or foreignness. there is clear evidence that some local aromatic rice (such as Champion) have similar or higher WTP and competitiveness as compared to some of the lower-quality imported aromatic rice, but they cannot compete with the high quality imported rice such as Gino.

An important factor to consider in gauging the potential for local products to compete against imports is whether there is a premium on 'localness'. A corollary to this question is whether consumers prefer imported rice because of superior quality alone, or due to a value attached to the 'foreignness' of imported rice. This is the premise behind campaigns to buy local products, for example by promoting 'made in Ghana' labels. If consumers have a desire to support local producers by purchasing their products, then there should be consumer demand for local products independent of the product attributes (Darby et al. 2008). Unlike Darby et al. (2018), who found that US consumers have a significant WTP for local fresh strawberries, and that this WTP was independent of the attributes, our experiments do not show much support for the preference for local products merely based on 'localness'. For example, for chicken, local processed meat does not command a premium over imported processed meat. There is a preference for freshness, which is also reflected in the results for tilapia, but there is no demand for 'localness' *per se*. One implication is that to improve the competitiveness of local products in the West African context, it may be more important to improve the branding of products with the labels that consumers care about, such as freshness or nutrition levels, rather than focusing on country of origin labels. Furthermore, a successful import substitution strategy will entail investments in the cold storage and handling facilities in the supply chain for higher-value products such as tilapia.

Consumers preference for fresh tilapia over frozen tilapia can serve as a natural barrier to import entry, and therefore there is potential for Ghana's aquaculture sector to expand, provided that continuous improvements in seed and extension systems are made and both industry coordination, as well as certification and regulation, are strengthened. A related question, for chicken, is whether consumers would attach a higher value to attributes of the local product such as freshness, if consumers had a higher exposure to the local product. This question has not been the focus of this paper, but we find that consumers have a strong preference for local chicken, and yet locally-produced fresh chicken is difficult to find on the market. Perhaps if production

and processing costs can be reduced slowly, there could be potential to expand local chicken production beyond the small niche that currently exits. This remains a question for future research.

Returning to address the question of low demand for local rice, our experiments also show that imported rice is preferred and has a reputation for better quality, therefore fetching higher prices and higher demand than local rice. Among the three products, rice is the hardest to fix under an import substitution strategy, because both supply- and demand-side strategies are needed to boost local competitiveness. These findings corroborate the existing studies on the difficulties of rice import substitution in West African countries (Demont, Fiamohe, and Kinkpé 2017; Demont, Rutsaert, Ndour, and Verbeke 2013). This is quite different from the situation in some other parts of Africa. For example, Lazaro, Sam, and Thompson (2017) find that consumers in Tanzania have a strong preference for domestic rice and its aromatic qualities over imported rice. Even within West African countries, Demont, Fiamohe, and Kinkpé (2017) show that there are disparities in urban consumers' preferences for imported or local rice, and that these differences are influenced by factors such as distances to ports and areas where local rice was first introduced into the country.

One implication of the evidence that is building up in the literature is that government and donor support for improving African rice production needs to differentiate between the various contexts and set priorities, taking into account the varied demand for attributes. For parts of Africa where domestic rice has an edge (e.g. West African cities far from ports or in countries like Tanzania) the focus has to be on improving yields to boost supply of domestic rice. On the other hand, to meaningfully challenge the existing dominance of imported rice in cities such as Accra, a more urgent and difficult task for government and local industry groups is to overcome the perception of domestic rice as inferior to imported rice. For rice in Ghana, the priority would be to improve upon the selection of varieties grown, in order to match the quality of Asian imports, and to address the processing issues that lead to low quality, for example the chalky appearance of local rice that has low demand. There are already aromatic rice varieties in Ghana, but they are not as productive as the non-aromatic varieties, so continuous seed improvement or transfer of technologies from other countries will be required. Also important is intensified marketing and promotion of those local brands that can compete with imported brands.

By analyzing the price and quality competitiveness for three products with rising importance in the diets of Ghanaians and West Africans, especially in growing urban areas, this paper has added to the available evidence on consumer preferences that governments, development agencies, and producer groups need in order to enhance the competitive advantage of local production. While much of the policy discourse and government initiatives on improving competitiveness has focused on trade tools or subsidies for farmers, this paper's findings support the emerging argument that there is a third dimension, the consumers' preferences, which has not received enough attention. Ultimately, any import substitution strategies will need to consider the findings from these types of consumer preference studies as part of the information available for developing the production and marketing strategies that will ensure that local farmers can benefit from new opportunities to feed an urbanizing West Africa.

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8 Appendix: Study Protocol

Recruitment of participants

We recruited participants from selected neighbourhoods in Accra. The neighbourhoods were purposively selected by the research team, a local survey firm, and staff of the Ghana Statistical Service (GSS), with a goal of including low-, middle-, and high-income neighbourhoods (See Table A4). For each neighbourhood, we obtained maps of enumeration areas demarcated by GSS for the national population and housing census. We listed 50 randomly-selected households in each enumeration area through an interview using a short, structured questionnaire. The interview included questions about the main decision maker in each household for food purchases.

We then randomly selected 10 households in each EA and invited the person responsible for food purchases to participate in the experimental auction in a centrally designated location within the EA. We conducted the auctions in central locations close to the various areas where participants were recruited. We used classroom blocks or church auditoriums within the EA. These are common community centers that people visit regularly and are suitable because it ensures that participants are not alienated from their usual environment. In total, 119 participants/households were recruited to participate in an auction. To deal with participant absenteeism, 2 extra participants were recruited in each EA as backup. A week prior to auctions, confirmation letters were sent to each selected household through field assistants. We held two auction sessions in each enumeration area, one in the morning and the other in the afternoon.

Experimental auctions procedure

The auctions involved bidding rounds separated by sensory evaluation of the rice and chicken samples. The sensory evaluation provides the participants the opportunity to assess the sensory qualities (aroma, texture, taste and overall acceptability) of each sample and then incorporate these into their bidding in the subsequent round of bidding that follows the sensory evaluation. This gives the opportunity to evaluate the influence of post-cooking qualities of the samples on WTP. The following steps were used for all the experimental auction sessions:

Step 1: Participants were invited to take part in experimental auction and sensory evaluation involving rice and chicken at the various designated venues. These are participants recruited from the various selected EAs. During recruitment, participants will have to meet the following two criteria to be eligible; must be a rice buyer and the maker of purchasing decision as to what type of rice to buy. However, during the auction, some households delegated an adult male/female who are household members to represent the household.

Step 2: Upon arrival at the venue each participant is ushered into a hall prepared for the auction and was taken through a registration process. During the registration, each participant receives a file containing bid sheets and identification number. The identification number is used to track all the auction materials of each participant. Identification numbers are important to maintain anonymity to prevent the problem of bidder affiliation. Prior to the beginning of the auctions, each participant answered a brief survey that include questions on demographic characteristics and purchasing behaviour. Before the start of the interview, each participant signed a consent form agreeing to participate in both the pre-auction interview and the auction itself.

Step 3: An introduction and briefing session is conducted by the experimenter to keep all participants informed about the activities for the day. The participants are then informed about the objective of the experiment which seeks to elicit their true willingness to pay for the products being auctioned and urge everyone to submit their true value for the products. Three vital information were provided to participants at this stage; the anonymity of the process, participation fee and the operation of the auction mechanism. The experimenter then explains the kth price auction mechanism to the participants with emphasis on the consequences of not bidding ones' true worth for the commodity. i.e. in such instances of not bidding one's true value for the commodity, one can be penalized by paying a higher price or one can miss out completely on not taking advantage of purchasing what one prefers at a lower price when one under-bids. [the scenario of not biding one's true value for a goat is used to illustrate the above point to participants]. Furthermore, participants were informed about their participation fee of GHC 55 (11.5 USD[10]) at the end of the auction. It is indicated to participants that the participation fee is for them and they can decide to either use it to purchase any of the commodities being auctioned. At this point, participants were reminded that "***in this auction the best strategy is to bid exactly what it is worth to you to obtain the commodity".***

Step 4: The experimenter then led a training session on the auction procedure with a special attention to the kth price auction mechanism. Training of participants is conducted using imported and local Ghanaian biscuits as have been used in previous studies. The researchers believe it fits well the context of the study that looks at local and imported food products. For the sake of time the training session was conducted over two rounds. In the training rounds participants submit sealed bids for the biscuit samples, the bid sheets were collected after each round and the bids collated. The top three bids were displayed on a whiteboard in front (but not the identities of the bidders). After two rounds of bidding, one round and one biscuit were randomly selected as binding and the top two bidders were awarded with the biscuits. In the training session, participant did not exchange money for the biscuits and were told the sole purpose of the training rounds is to aid their understanding of the auction procedure. At this point participants are again reminded of the consequences of bidding (i.e. the market price for the produce will be deducted from their participation fees) and therefore it is only in their best interest to submit their true willingness to pay amount.

Step 5: In the conference room where the auction is taking place, a table is placed in front with all the selected rice or chicken brands displayed on the table in their original packaging (the rice in 5kg packaging and the chicken in paper boxes of 10kg each except for the sample labeled local fresh chicken that has no packaging). Participant were then informed about which of the rice types are local brands and which of them are imported brands, the same is done for chicken[11]. Each participant again has the various rice types displayed in bowls of 400g each and 1 kilogram each for chicken in front of them on their respective table. This is to enable the participants to examine the visual quality attributes of the uncooked rice or chicken during the auction[12].

[10] Exchange rate is sourced from; http://www.bog.gov.gh/markets/daily-interbank-fx-rates

[11] Separate auctions were held for rice and chicken within each auction session

[12] The same is done for chicken

Step 6: Participants were instructed to visually inspect the rice or chicken samples placed on their tables in front of them with each sample labeled appropriately. The arrangement of the rice and chicken brands on each participants table is randomized. After the visual inspection each participant receives a checklist with which they rank each product type with the most preferred as 1 and the list preferred being 6 for rice and 5 for chicken.

Step 7: Each participant then simultaneously submits sealed bids on bid sheets provided to them for each of the rice and chicken brands being auctioned. At the end of each round the bid sheets were collected, and all the bids collated. The top two highest bids as well as the third highest bid (i.e. the market price) are displayed on a whiteboard without revealing the identity of the corresponding bidders. This was repeated for two rounds.

Step 8: Each participant is served cooked samples of the rice and chicken being auctioned. All the food samples were prepared by the Food Research Institute following the same protocol and was transported to the auction center in food warmers. The participants taste each sample and provide an evaluation of each for aroma, texture, taste and overall acceptability on a 9-point hedonic scale. Participants were instructed to taste each rice type and rinse their mouth in-between each tasting. For chicken, participants eat slices of cucumber in-between tasting to prevent the taste of the previous sample from having any influence on the taste of the next sample. To incorporate a random factor in the sensory evaluations, we randomized the order in which each sample is presented to all participants. Demont et al. (2012) who employed experimental auctions together with in-between subject treatment of sensory evaluation to study urban bias in rice markets in Senegal, indicated a likely flaw in their finding due to their approach of serving cooked samples of the rice types being auctioned without any supplement in their sensory evaluations, thus allowing the sensory evaluation to favor rice grain heterogeneity. In addressing this potential flaw in our study, the sensory test involves participants tasting a rice dish first without a complement and then with a complement (i.e. plain rice with sauce) prepared using each rice sample. The chicken samples being auctioned are served separately from the rice. In order not to bias the sensory evaluation, the rice and chicken samples were labeled each with a 3-digit code each representing a rice or chicken brand. The meaning of the codes was revealed to participants after the sensory evaluation before bids for the third round were received.

Step 9: After the sensory evaluation participants were instructed to submit sealed bids for the third and final round. Thus, participants are given the opportunity to incorporate the sensory attributes of the samples into their final round of bidding. The bid sheets are collected, the bids are collated, and the top three bids are displayed on a whiteboard.

Step 10: A random drawing was employed to determine which bidding round is binding. One product was then randomly selected as binding and the top two highest bidders who bided higher than the market price (i.e. the third highest bid) had the market price deducted from their participation fee and the balance presented to them together with the product won. In some instances, we had tied bids, where more than one participant bided either the second or first highest bid. In such instance, we use random draws to select two participants as winners.

Annex 1. Cheap talk script

We are going to ask you a few questions about whether you would purchase local or imported tilapia at a price level. This purchase is hypothetical, that is, you do not actually pay money when you indicate a preference. The experience from previous surveys is that people often respond in one way but act differently. It is common that one states a higher willingness to pay than what one is willing to pay for the good in the store. To avoid this situation, we ask you to respond to each of the following purchase questions just exactly as you would if you were really in a shop and were going to face the consequences of your decision - which is to pay money if you decide to buy a food product within your budget constraint. There are no right or wrong answers, and your honest responses will be very useful for farmers and businesses in producing and developing new safe food products that can satisfy consumer preferences at reasonable prices.

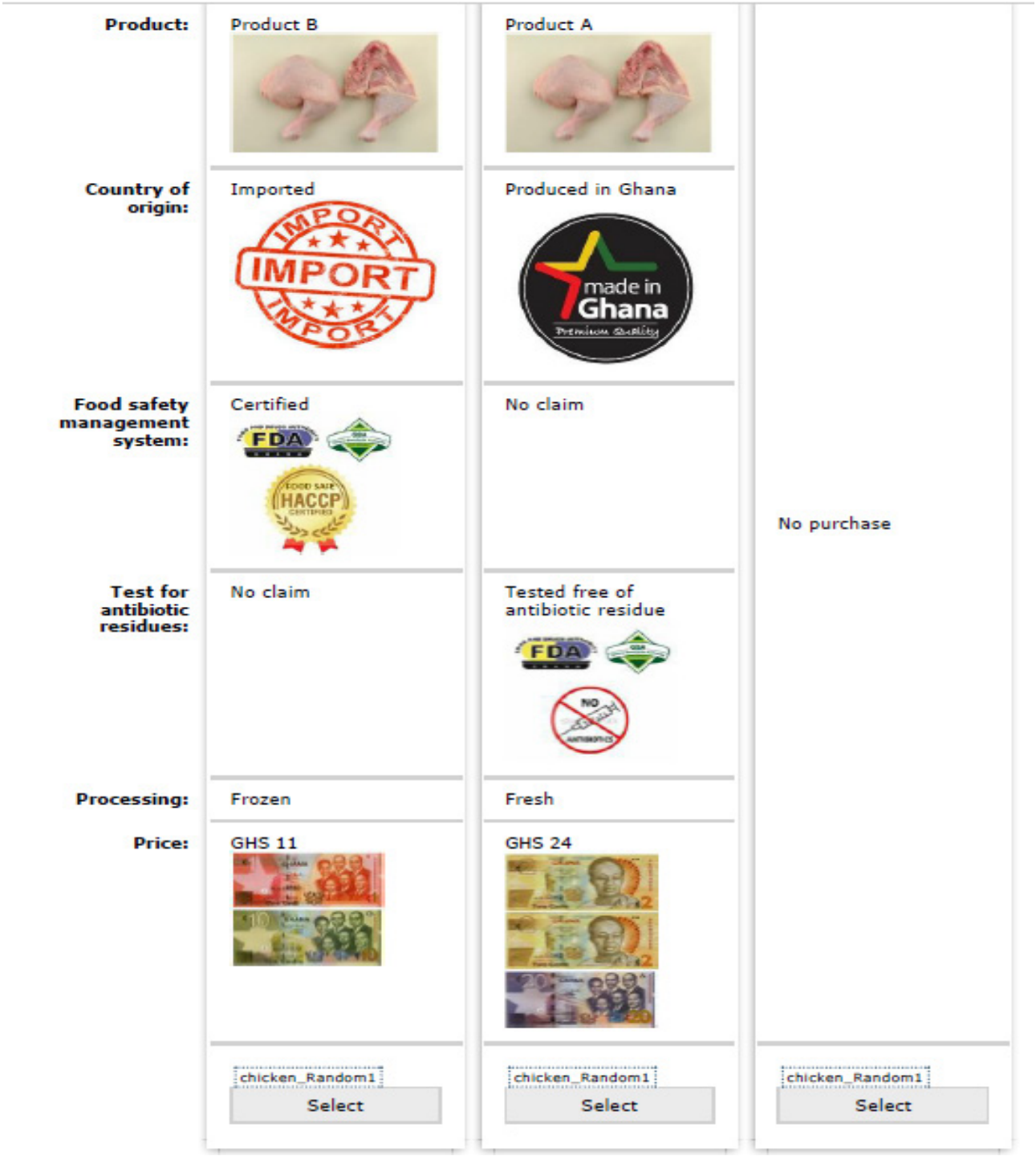

Figure A1. Sample choice set for discrete choice experiments.

Source: Discrete choice experiments (2018)

Table A1 Post-sensory ranking of attributes of rice samples (% of participants)

	Champion (Ghana)	Copa (Ghana)	DUQ (Ghana)	Gino	Millicent	Royal Aroma
Aroma						
Dislike extremely	8	8	10	3	5	5
Dislike moderately	11	20	24	5	10	17
Neither like nor dislike	13	8	12	3	9	8
Like moderately	36	47	34	24	32	39
Like very much	31	16	20	64	42	28
Appearance						
Dislike extremely	8	5	13	0	1	2
Dislike moderately	13	13	21	1	4	10
Neither like nor dislike	6	13	10	2	6	8
Like moderately	40	42	35	13	29	50
Like very much	33	26	18	84	60	31
Texture						
Dislike extremely	3	7	6	0	2	3
Dislike moderately	8	13	17	5	6	14
Neither like nor dislike	6	8	6	3	8	8
Like moderately	32	39	36	21	34	43
Like very much	49	31	34	71	50	30
Taste						
Dislike extremely	3	3	10	0	6	3
Dislike moderately	5	6	16	3	8	12
Neither like nor dislike	6	8	8	3	2	8
Like moderately	39	43	35	19	32	45
Like very much	47	39	30	75	52	31
Overall acceptability						
Dislike extremely	3	2	9	1	3	5
Dislike moderately	5	7	19	0	5	10
Neither like nor dislike	6	10	11	5	10	8
Like moderately	42	46	34	13	35	49
Like very much	45	35	25	81	46	28

Source: Experimental auctions (2018).

Table A2. Post-sensory ranking of attributes of chicken samples (% of participants)

	Aglow (Ghana)	Brazil	Holland	Local fresh	USA
Texture					
Dislike extremely	3	6	3	1	1
Dislike moderately	9	6	5	8	3
Neither like nor dislike	5	8	5	6	4
Like moderately	32	34	45	45	36
Like very much	50	46	41	40	56
Taste					
Dislike extremely	3	3	3	3	3
Dislike moderately	6	8	6	4	3
Neither like nor dislike	8	7	3	5	6
Like moderately	31	37	43	42	28
Like very much	53	45	45	46	60
Overall acceptability					
Dislike extremely	2	3	4	6	3
Dislike moderately	3	5	3	4	6
Neither like nor dislike	3	9	3	6	5
Like moderately	38	32	42	38	27
Like very much	55	50	47	45	58

Source: Experimental auctions (2018).

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