Chapter 2

EVOLUTION OF RICE CONSUMPTION AND DEMAND PATTERNS

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The ultimate objective of food policy generally and rice policy specifically for Nigeria is to ensure food security and improved household welfare for the majority of Nigerians. As already highlighted in Chapter 1, this has particular relevance for Nigeria given the government's concerns about the country's growing dependency on rice imports, as evident in the introduction of policies to encourage domestic rice production and achieve rice self-sufficiency. However, such policies can negatively affect household welfare, especially if prices rise sharply as a result of the policies and a majority of Nigerian consumers happen to consider rice a major staple. Therefore, to understand how rice policy might impact the lives of the average Nigerian, it is necessary to understand the importance of rice in the Nigerian diet as well as the demand behavior for rice by the average Nigerian household, which is the objective of this chapter.

The chapter begins by highlighting how rice has become a dominant food staple in the Nigerian diet over a relatively short period of time. This is accomplished by examining trends in rice consumption, both on aggregate and per capita terms, over the postcolonial period, including regional and urban/rural differences. This is followed by a discussion on the possible explanations or determinants of the growth in demand, including a look at local trends in rice prices.

Following this, the chapter empirically estimates the behavioral patterns of demand for rice in Nigeria by rural and urban populations and income status. The analysis uses a linear expenditure system demand model and the most recent data from the 2011 Living Standards Measurement Study–Integrated Surveys on Agriculture (LSMS–ISA) (Nigeria, NBS and World Bank 2011), which is the nationally representative household data collected by the World Bank and the NBS. The results of the analysis provide parameter estimates of average budget shares (ABS) and marginal budget shares (MBS), income, and own- and cross-price elasticities, which can be invaluable for informing future rice policies. A summary and discussion of the key findings from the analysis and their policy implications conclude the chapter.

Trends in Rice Consumption

Nigeria has a rich history of rice production and consumption, as indigenous rice species (local rice) have been grown and consumed in the country for over 300 years (Akinbile 2007). However, the dominance of rice as a major staple in the Nigerian diet is a fairly recent phenomenon, as can be seen in Figure 2.1. Aggregate rice consumption grew from a few thousand metric tons at the time of independence in 1960 to over 5.2 million tons in 2012.[1]

It is interesting to note that the dramatic increase in rice consumption began in the late 1970s. This coincided with—and may have been caused by—the astronomical increase in world prices of crude oil at that time, which gave Nigeria large amounts of foreign currency reserves. This in turn led to the appreciation of the naira, making it cheaper to import food (rice) rather than to produce it at home.[2] Figure 2.1 makes it clear that the growth in consumption was not limited to rice but included other major cereals and food crops, such as yams and cassava, although the increase in rice consumption preceded those of yam and cassava by a decade.

The rapid growth of the Nigerian population as well as increased income has been partly responsible for the upsurge in demand for all food commodities, including rice. However, there are two major reasons to pay special attention to rice. First, its position has changed from virtually not being eaten in the 1960s to becoming a major staple crop today. Based on the amount of kilo calories of food staples available per person and per day in Nigeria, the two charts in Figure 2.1 show that the supply of milled rice from domestic production and imports has increased at a rapid rate, and the crop has almost caught up with cassava and yams as a principal staple. Indeed, measured by the share of the household budget devoted to different food commodities, as we will show later in this chapter, rice has now become the leading food staple in Nigeria.

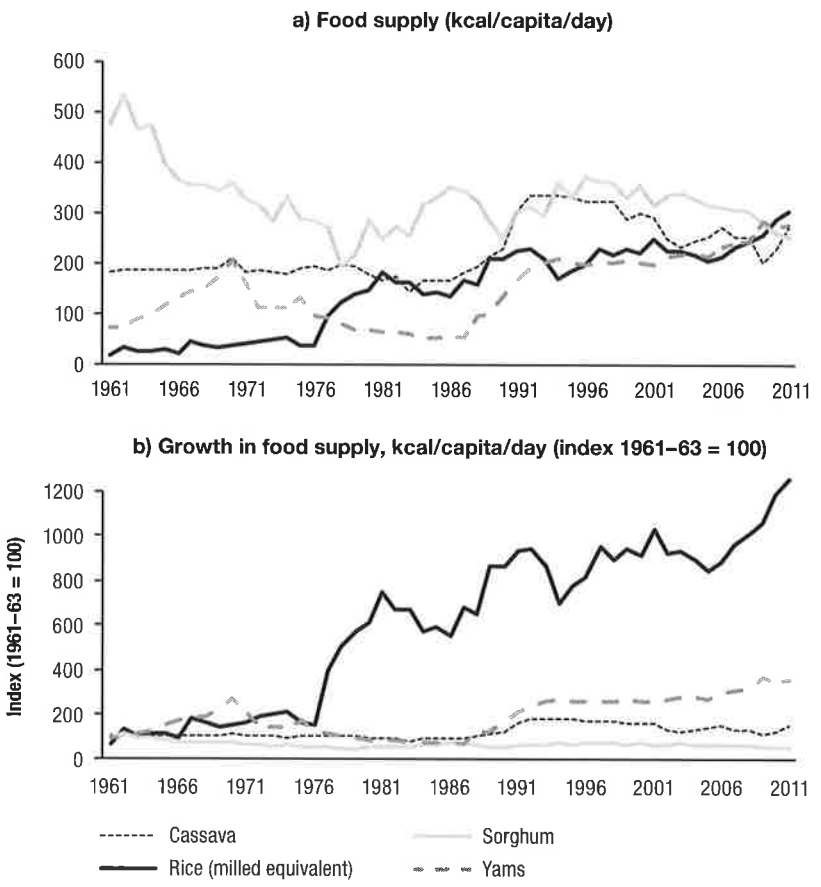
The second reason is that of all the major staple crops shown in Figure 2.1, rice is the only staple for which imports are increasingly being used to meet domestic demand. As Figure 1.2 in Chapter 1 shows, local rice production has not kept up with a growing domestic demand. Consequently, imports have made up for the growing difference between consumption and local production.

The exponential growth in rice consumption that has occurred in Nigeria is also being replicated in other parts of Africa, particularly in West Africa (Figure 2.2), and in other parts of the world. Per capita rice consumption in Nigeria has yet to catch up with the average for West Africa, mainly because of

1 Metric tons (hereafter "tons") are used throughout the book.

2 This is a classic case of the Dutch Disease arising from natural resource discovery and exploitation. This is further discussed in Chapter 5 on rice trade in Nigeria.

FIGURE 2.1 Availability of rice and other major staples, 1961–2011



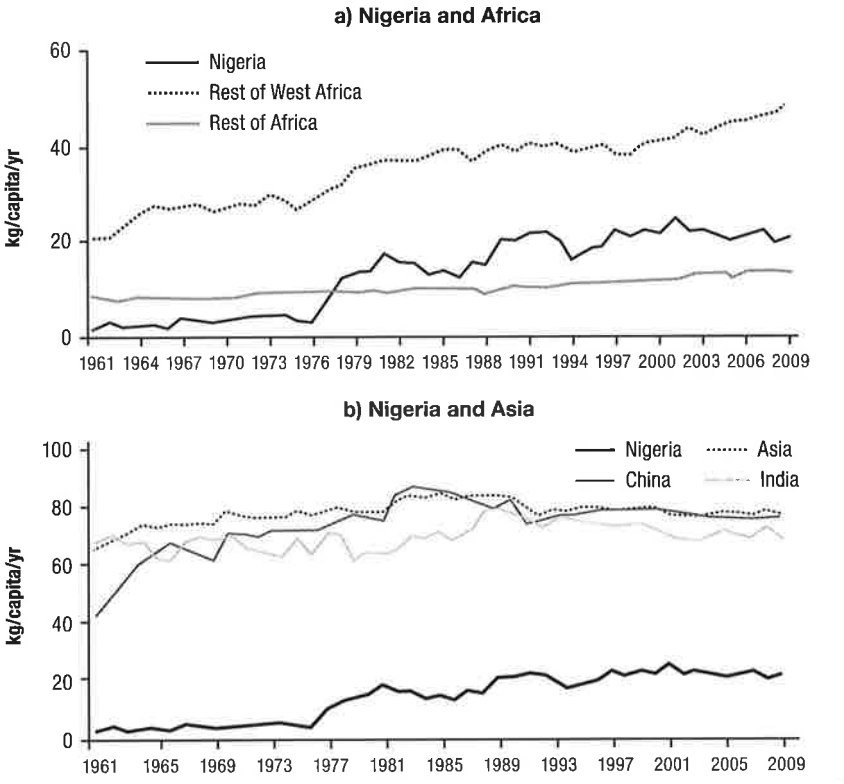
Source: FAO (2014).

Note: While the horizontal axes of 2.1a and 2.1b are measured at the same scale, the vertical axes of the two figures are different. The vertical axis of Figure 2.1a is measured in absolute numbers, but the vertical axis in Figure 2.1b is measured as an index, so changes should be measured as relative to the base period (1961–1963).

the large gap between Nigeria and major rice-consuming countries such as Liberia, Sierra Leone, and Senegal. Setting aside these three major rice consumers, however, Nigeria's consumption is impressive: it has risen above the average for the rest of Africa and is increasing at about the same rate as the rest of West Africa.

It is also instructive to note that since the late 1970s, trends in per capita rice consumption in Africa generally and West Africa in particular have mimicked the trend in per capita consumption in Nigeria. While rice consumption in Nigeria and West Africa in general is well below levels in Asia and major

FIGURE 2.2 Per capita rice consumption: (a) Nigeria and Africa; (b) Nigeria and Asia



Source: FAO (2014).

rice-consuming countries such as China and India, where consumption is about 60–80 kilograms (kg) per capita per year, both per capita and aggregate consumption in Nigeria are rising faster than in other regions of the world.

It is also interesting to note in Figure 2.1 that per capita availability of rice has grown considerably in the past several decades and has become comparable to other major staples in Nigeria such as yams, cassava, and sorghum. The growth suggests that Nigerian consumers may be substituting rice for cassava and possibly other cereals in consumption. If current trends continue, it is possible that rice will surpass cassava as the leading staple in both volume and value in less than a decade.

Current Rice Consumption

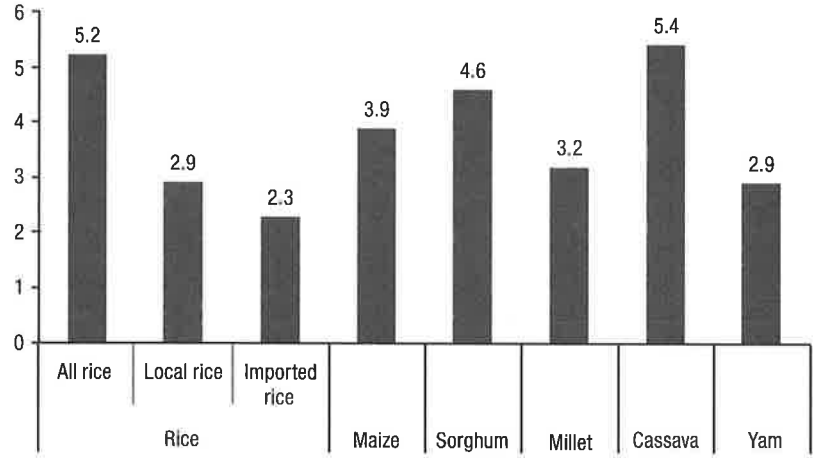
Table 2.1 shows the ranking of food consumption in kilograms per capita and per capita expenditure. Rice has become one of the most dominant staples in the

TABLE 2.1 Ranking of per capita consumption and expenditure

Commodity	Annual consumption (kg/capita)	Rank by consumption quantity per capita	Annual expenditure (naira/capita)	Rank by expenditure per capita
All rice	32.1	2	3,951	1
Local rice	17.6		1,893	
Imported rice	14.5		2,058	
Maize	24.1	4	1,164	4
Sorghum	28.3	3	960	5
Millet	19.8	5	786	6
Cassava	33.1	1	2,374	3
Yam	18.2	6	2,824	2

Source: Authors' calculation from Nigeria, NBS and World Bank (2011).

FIGURE 2.3 Aggregate consumption of rice and other major staples in 2011 (million tons)



Source: Authors' calculation from Nigeria, NBS and World Bank (2011).

Nigerian diet. It now ranks first among all staple food items in terms of expenditures and is second only to cassava in terms of quantities consumed. Figure 2.3 shows the aggregate quantities of major food items consumed in Nigeria. By volume, the per capita consumption of rice is 3 percent less than that of cassava; however, by value, per capita consumption of rice exceeds that of cassava by as much as 67 percent, indicating how dominant rice has become in the Nigerian food budget.

Rice not only dominates other cereals, it also dominates the average Nigerian budget. Table 2.2 shows that 5.2 million tons of rice were consumed in Nigeria

TABLE 2.2 Rice consumption and production in 2011

Commodity	Total consumption (million tons)[1]	Total consumption share (%)	Total production (million tons)[2]	Total production share (%)
All rice	5.20		5.16	
Local rice	2.85	54.8	2.71	52.5
Imported rice	2.35	45.2	2.45	47.5

Source: (1) Authors' calculation from Nigeria, NBS and World Bank (2011); (2) United States Department of Agriculture International Database (USDA 2013).

in 2011 (the last year for which we have complete data). Of this amount, only 2.85 million tons were produced locally, while 2.35 million tons were imported. Table 2.3 shows average budget shares of a large number of food and nonfood items in the average Nigerian household's budget. The average Nigerian household spent over 6 percent of its total income on rice consumption in 2011. This budget share was the highest among food staples in this time period, and the pattern is similar for both urban and rural households.

Compared to other staples, rice is also widely consumed across the population: 84 percent of households reported consuming rice at home (Table 2.4).[3] There are, however, minor spatial differences in the pattern of rice consumption: while 91 percent of urban households in Nigeria consume rice, a slightly lower percentage—80 percent—of rural households do so. Consumption of imported and domestic rice also differs by location. While 72 percent of rice consumed by urban households is imported, only 33 percent of that consumed by rural households is imported. Table 2.3 shows that with the exception of nonfood items and dining out, rice dominates all other food items in the Nigerian household budget. The only exception is rural households, where fruits and vegetables make up a slightly larger share of households' food budget than rice.

RICE CONSUMPTION BY SECTOR AND ZONE

As noted earlier, there are differences in rice consumption across demographic and regional groupings in Nigeria. Table 2.4 shows that rural households consume more local rice than imported rice, while urban households consume more imported than local rice. Table 2.5 presents more disaggregated information on the structure of rice consumption by geopolitical zones in Nigeria.[4]

3 It is important to note that the data on which this analysis is based comes from LSMS–ISA (Nigeria, NBS and World Bank 2011), which surveyed households on their consumption patterns over the last seven days prior to being surveyed. While it is possible that there are households that consume rice regularly but had not done so in the last seven days and vice versa, we nevertheless assume this is a reasonable snapshot of the average proportion of households that consume rice in Nigeria.

4 For the geopolitical zones in Nigeria, see the footnote of Figure 1.1.

TABLE 2.3 Average household budget share across commodities

	Average budget share (%)		
Commodity	Urban	Rural	National
All rice	5.7	7.0	6.6
Local rice	1.8	4.7	3.8
Imported rice	3.8	2.4	2.8
Maize	1.2	2.7	2.2
Wheat	1.7	1.5	1.6
Sorghum/millet	1.3	5.7	4.3
Other grains	0.1	0.1	0.1
Cassava	3.2	4.8	4.3
Yam	4.6	5.3	5.0
Other roots	1.3	1.6	1.5
Pulses	3.0	3.9	3.6
Oils and fats	4.7	6.7	6.1
Fruits/vegetables	5.2	7.1	6.5
Milk	1.1	1.0	1.0
Poultry	0.9	1.1	1.0
Other meat	5.3	6.1	5.9
Fish	5.5	5.9	5.8
Other food	3.1	3.8	3.5
Dining out	12.8	9.3	10.4
Nonfood	39.5	26.4	30.5
Total	100	100	100*

Source: Authors' calculation from Nigeria, NBS and World Bank (2011).
Note: *Because of rounding, the percentages may not always add up to exactly 100.

TABLE 2.4 Share of households consuming rice by region

Region	Share of households consuming rice (%)	Share of households consuming imported rice (%)
Urban	90.8	71.8
Rural	79.9	33.1
National	83.8	48.2

Source: Authors' calculations based on Nigeria, NBS and World Bank (2011).

Generally, in each zone rice ranks very high in terms of expenditure as well as consumption volume compared to other main crops (Table B.1 in Appendix B). Per capita consumption ranges from a low of 20.9 kg per year in the South South to a high of about 39.6 kg per year in the North West, where rice is more important in the consumption baskets of households. While rice is

TABLE 2.5 Consumption patterns by region

	Urban			Rural		
Group	Expenditure (million naira/year)	Quantity (thousand tons/year)	(kg/capita)	Expenditure (million naira/year)	Quantity (thousand tons/year)	(kg/capita)
North Central						
All rice	26,660	191	28.6	54,605	495	28.8
Local rice	10,758	96	14.4	37,126	389	22.6
Imported rice	15,902	95	14.2	17,479	106	6.2
North East						
All rice	19,689	138	39.7	61,477	543	29.3
Local rice	12,580	99	28.5	51,237	482	26.0
Imported rice	7,109	39	11.2	10,240	61	3.3
North West						
All rice	62,462	514	53.0	142,428	1,260	39.5
Local rice	43,401	389	40.1	124,084	1,144	35.9
Imported rice	19,061	125	12.9	18,344	116	3.6
South East						
All rice	13,022	192	36.2	29,446	363	26.3
Local rice	2,225	25	4.7	12,059	111	8.1
Imported rice	10,797	167	31.5	17,387	252	18.2
South South						
All rice	41,772	234	24.4	53,440	314	20.9
Local rice	2,117	19	2.0	7,780	78	5.2
Imported rice	39,655	215	22.4	45,660	236	15.7
South West						
All rice	101,059	774	32.8	30,575	184	26.4
Local rice	1,171	9	0.4	1,339	10	1.5
Imported rice	99,888	765	32.4	29,236	174	24.9

Source: Authors' calculations based on Nigeria, NBS and World Bank (2011).

not always the dominant food item in terms of per capita consumption in all regions, it always ranks very highly regardless of geopolitical zone.

Table 2.5 also shows that the type of rice consumed differs across zones of Nigeria as well as between rural and urban areas. There is a preference for local rice in the northern zones, where it accounts for over 80 percent of the rice consumed, compared to the southern zones, where only about 12 percent is local rice. While imported rice and local rice are consumed in roughly equal proportions in urban areas of the North Central zone, the consumption of local rice dominates that of imported rice in rural areas of the North Central

and both rural and urban areas in the North East and North West. The opposite applies in the southern zones (South West, South South, and South East), where imported rice dominates, even in the rural areas, where very little local rice is consumed. These patterns of consumption may hold for several reasons that are discussed in greater detail below.

RICE CONSUMPTION PREFERENCES BY REGION

There are several varieties of local rice grown and consumed in different regions of Nigeria, and they are often prized for specialized purposes. Generally, local varieties of rice grown in Nigeria tend to be short to medium grained, absorb water upon cooking, and can be made into a paste for local dishes—qualities that are not possessed by imported rice. Examples of some of the local rice varieties cultivated and consumed in the three northern regions include *galaware* (African wild rice), *yar-yarmidi*, *yar-kera*, *yar-kilaki*, *yar-das*, *dukusa*, *yar-banki*, *yar-mubi*, *yar-tundun wada*, WITA 4, and *yar-mubi*.[5] Of these varieties, *yar-tundun wada* is of long grain with brightness, while others are of short grains, bright, and well filled.

They all possess high-quality processing characteristics and organoleptic (length, taste, and swelling) properties. These properties give local varieties an edge over imported rice in the preparation of several local dishes frequently consumed in the region, such as *tuwo*, *sinasir*, and *waina/masa* (PrOpCom 2007a, 2007b, 2007c). Imported rice cannot be used to prepare these local dishes because it does not have the aforementioned characteristics.

In the southern zones, there are also several varieties of local rice produced and consumed. However, the varieties of rice consumed in the South South and South East zones are very similar. Local rice in the Igbo-dominated South East is known as *osikapa*. The characteristics of this rice variety are that the grains are usually of white, yellow-red, and variegated type. Okeke et al. (2008) described the local rice varieties as being "cream colored and tasting better than some of the 'exotic' imported rice." He also likened the *osikapa* rice to *fufu* (a popular West African staple made of cassava, maize, or wheat flour).

The South East is also often associated with the consumption of Abakaliki rice—named after the local rice mill in Ebonyi State (for the location of each state, see Figure 1.1).[6] While the generic name is Abakaliki rice, it is in fact a mixture of several rice varieties. Oko, Ubi, and Efisue (2012) present a comprehensive analysis of some of the Abakaliki rice varieties. They identified the superior qualities of local rice varieties in Ebonyi State of the South East as having "high amylopectin content, tender texture, and length expansion

5 See http://www.propcommaikarfi.org/wp-content/uploads/2013/08/12-Kano-Rice-Baseline-Report-4-07.pdf for a more comprehensive breakdown of the different northern rice varieties.

6 See http://www.nigerianorientnews.com/?p=1400.

on cooking without affecting the width."[7] This variety of rice is usually consumed boiled and eaten with stew.

The local rice in the South West has become synonymous with *ofada* rice, a popular variety that is discussed in more detail in Box 2.1 as it is an interesting case study of a popular niche market for local rice. However, *ofada* is not

BOX 2.1 Case study of *ofada* rice

Ofada rice is a variety found in the South West and grown almost exclusively in Ogun State. It takes its name from Ofada, the town in Ogun State where it was first cultivated. It is characterized by a very strong aroma, as well as the tendency to swell or increase in size, resulting in the claim that "a little quantity fills one up." It is generally eaten with a vegetable-based stew that is sometimes made with locust bean.

The grains are short but large, aromatic if brown and non-aromatic if white, and perceived to be more nutritious than imported rice (PrOpCom 2007c). *Ofada* rice is not an indigenous African rice; it has existed in Ogun State only since the 1940s, when according to rumor it was smuggled into Nigeria by a soldier who returned from Asia and planted this variety of rice in his hometown of Ofada.

In recent years, *ofada* rice has developed from being viewed as an inferior variety to a premium, highly desired rice variety. There is no verifiable data on acreage under cultivation or quantities consumed, but from anecdotal evidence the demand for *ofada* rice has been growing exponentially since the early 2000s, particularly in the South West, where it has become indigenous.

It appears that this increased awareness of *ofada* rice coincided with an intervention by the Department for International Development of the United Kingdom, known as Promoting Pro-poor Opportunities in Service and Commodity Markets, which funded a commodity and service market for *ofada* rice. The initiative was carried out in conjunction with many local agencies, including the Agricultural Development Project (ADP) and the rice farmers' associations, to increase knowledge about the production process and public awareness of *ofada* rice.

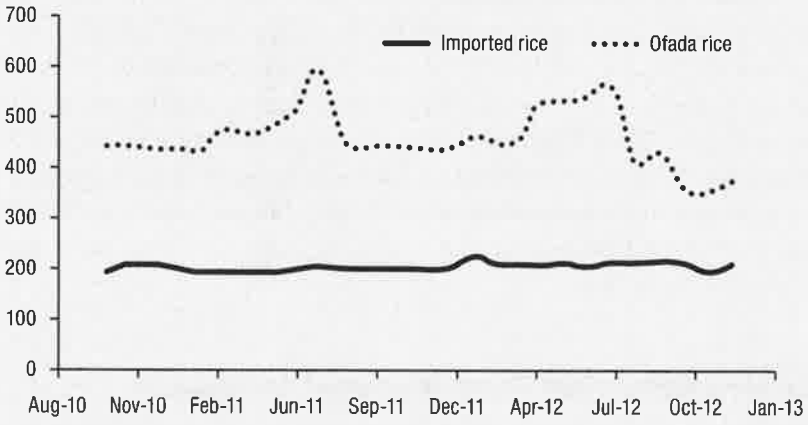
Figure B2.1 shows the trends in real prices of *ofada* rice and imported rice in Abeokuta between the last quarter of 2010 and December 2012. Imported rice prices were very stable over the period. *Ofada* rice prices, on the other hand, have been consistently higher than the real price of imported rice. *Ofada* rice has increasingly been viewed as premium rice, superior to

7 Oko, Ubi, and Efisue (2012), pp. 11–17.

other local varieties, often served at high-level parties, and served as a delicacy at very exclusive restaurants.

There have been many questions regarding this meteoric ascension of *ofada* rice to the top of the local rice food chain. It was initially assumed that it was due to improvement in the processing of this particular brand of local rice. However, field visits have shown that this is not strictly true. While processors are responding to consumer demands for cleaner local rice by packaging *ofada* in more attractive ways, the rice is being processed not with specialized machines but using manual labor.

FIGURE B2.1 Real prices, in naira, of imported and *ofada* rice in Abeokuta, Ogun State (October 2010–December 2012)



Source: National Bureau of Statistics data.

Ofada rice has a very special aroma, which is achieved through a fermentation process. The aroma has now become its distinguishing feature. It has become a staple at high-class parties. The rice has become branded by being served in leaves with a special sauce. In addition, the high price is regarded by some as a status symbol. *Ofada* rice has also been marketed as having many health benefits. It is unpolished rice, so it still retains good nutritional value.

The key message that emerges from the *ofada* rice case study is that Nigerians are willing to pay premium prices for local rice (even higher than for imported rice) if it meets their quality and taste standards. These types of rice can compete effectively with rice imports. One characteristic of *ofada* is the fact that it has been branded and marketed as unique. Perhaps the lesson for policymakers is that besides improving quality, branding and marketing Nigerian rice through information campaigns might be very effective. Perhaps creating more niche-market rice is another option for policymakers.

the only local rice variety grown and consumed in the South West. A large variety of New Rice for Africa (NERICA) species are cultivated in the South West, in addition to many indigenous species (e.g., *igbimo* in Ekiti State), but *ofada* remains the most popular and best known. *Ofada* is not a single variety and therefore unique; however, the way it is processed, packaged, and prepared for cooking gives it its unique characteristics (PrOpCom 2007c), as well as the fact that it is generally eaten on special occasions.

CONSUMPTION FROM OWN-PRODUCTION

According to the LSMS–ISA (2011) data, an overwhelming proportion of rice consumers buy their rice on the market; however, a significant number and proportion of consumers produce their own rice for consumption. Own-production and consumption accounts for about 20 percent of all local rice consumed in Nigeria and about 10 percent of all rice consumed in the nation. Nationally, about 13 million individuals reported producing the rice they consumed in 2011. About 82 percent of these own-production consumers are in the northern zones, with the North East and the North West having the largest share of individuals who produce the rice they consume. On the other hand, own-production consumers are negligible in the southern zones, especially in the South West.

Factors Affecting Rice Demand in Nigeria

Several factors, including rapid urbanization, accelerated population growth, increased per capita income, and changes in family occupational structures and lifestyles have contributed to increased demand for rice (Akpokodje, Lançon, and Erenstein 2001; Akande 2002; UNEP 2005; DeMont et al. 2013). Urbanization is a major factor in rice demand because of the lifestyle changes it engenders, requiring foods that are convenient and quicker to prepare, and rice meets these conditions very satisfactorily. It is clean and easier and less time consuming to prepare than traditional Nigerian staples such as cassava or yam.

While most consumers combine imported and local rice in their diets, urban households generally have a preference for imported rice (Table 2.6). The characteristics that have endeared many of these consumers to imported rice include higher quality—defined as a higher swelling capacity, better taste, and preferred grain shape—as well as cleanliness, as imported rice tends to be polished, nonbroken, and free from stones and other debris (Bamidele, Abayomi, and Esther 2010; Lançon et al. 2003a). This type of

TABLE 2.6 Household budget shares and income elasticities of demand

Commodity	(1) Average budget share (%)	(2) Marginal budget share (%)	(3) Expenditure elasticity	(4) Market price (naira)	(5) Average household expenditure (naira)	(6) Value of gamma[a] (naira)	(7) Share of gamma in expenditure (6)/(5) (%)
All rice	6.6	4.2	0.63				
Local rice	3.8	1.7	0.44	93	273	214	78.4
Imported rice	2.8	2.5	0.88	166	203	113	55.7
Dining out[b]	10.4	16.8	1.61	900	751	145	19.3

Source: Linear Expenditure System model results.

Note: [a]Gamma represents the part of expenditure for subsistence consumption of food. [b]The market price of dining out here represents the average cost of dining out for a family of four. The average total household expenditure on dining out is low relative to the price of dining out, suggesting that most households do not dine out.

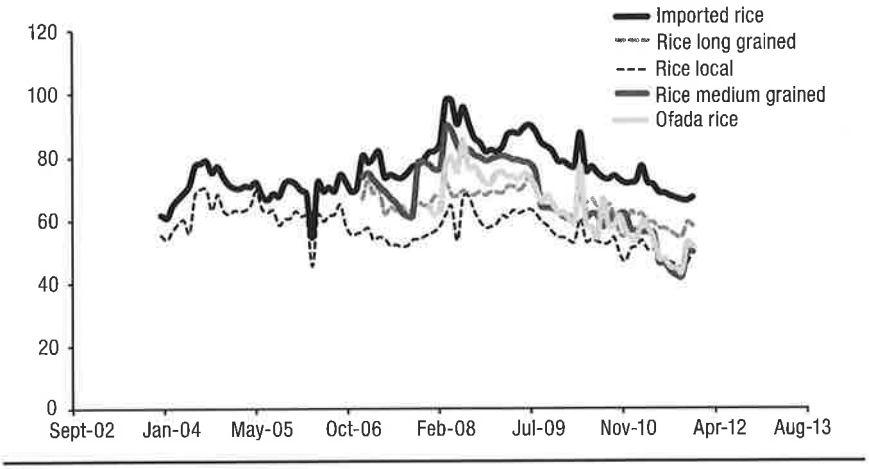
rice is better suited to cooking foreign dishes, which are often favored by urban households.

As with imported rice, local rice is consumed for several reasons: it is cheaper, and it possesses organoleptic attributes that make it a vital component in certain local delicacies (Bamidele, Abayomi, and Esther 2010). These delicacies include *tuwo* in the north, where local rice is preferred for its ability to absorb water and to be pounded into paste, and *ofada* rice in the South West, which is preferred for its unique aroma. The problem with local rice is that it is often not properly processed, has a high percentage of broken grain, and usually includes foreign matter (e.g., stones). Most varieties of local rice produced in Nigeria are of short-grain types. These are usually viewed as inferior rice, and most consumers of local rice (particularly in urban areas) aspire to be able to afford imported rice, which is cleaner, requires less processing time, and can be utilized to prepare a wide variety of foreign dishes (e.g., *jollof* rice, fried rice) as well as local dishes.

Trends in Rice Prices

An important determinant of the quantity purchased of any good is its price. To understand the demand for rice, it is therefore necessary to discuss changes in the real prices of rice over time in Nigeria. Figure 2.4 presents trends in real prices of rice nationally for imported rice and several varieties of local rice between 2003 and 2011. The prices are real naira prices, with 2003 as the base year for a kilogram of rice. Generally, the real price of all rice—imported and different varieties of local rice—trended downward over the period, although the rate of decline was not smooth; prices tended to fluctuate from one year to the next even though the downward trend is clear. The domestic price of

FIGURE 2.4 Trends in real rice prices (national)



Source: National Bureau of Statistics data.

Note: The prices are real naira prices, with 2003 as the base year for a kilogram of rice. NBS data do not provide an explanation of how rice is categorized as "rice long grained," "rice local," or "rice medium grained."

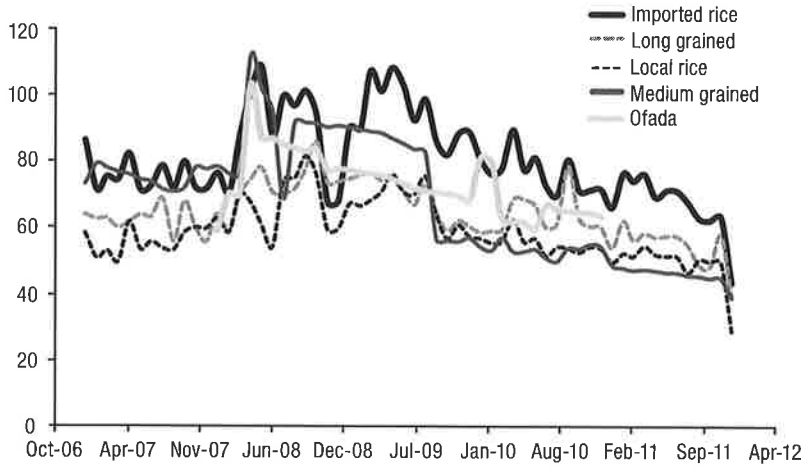
imported rice and the prices of local rice moved in the same direction as international prices. The large spike in the domestic price of rice in 2008 tracks the rise in international prices resulting from the 2008 global food crisis. It appears that trends in the domestic market price for rice are related to changes in the price of rice in the international market, exchange rate, and rice trade policies in Nigeria.[8]

Generally, imported long-grain rice and other long-grain rice have consistently commanded higher prices than those of local rice, even though all prices move in the same direction. While the price of local rice is usually lower by a healthy margin than that of imported rice, the prices of some local niche rice, such as *ofada,* are closer to imported rice. Indeed, in some zones of Nigeria such as the South West, the price of *ofada* rice exceeds that of imported rice.

Prices for *ofada* rice (though only available since 2008) have also been consistently higher than prices of other local rice varieties, indicating that *ofada* is premium rice. This suggests that Nigerian consumers are willing to pay higher prices for local rice if it meets their quality and taste standards. The policy implication is that there should be increased emphasis on processing in order

8 Chapter 7 on rice trade provides a detailed discussion of the evolution and determinants of rice price in the domestic Nigerian market.

FIGURE 2.5 Enugu prices (naira/kg), 2006–2012



Source: National Bureau of Statistics data.

to increase the quality of local rice to attract the Nigerian consumer, especially those with higher incomes.

There have been no studies that track and explain the observed trends in real prices of rice in Nigeria over the 2002–2012 period. However, it is likely that Nigerian real rice prices are mostly driven by demand-side factors combined with (1) changes in the world price of rice and (2) exchange rate and trade policies. As discussed earlier, both per capita and aggregate demand for rice in Nigeria have been increasing at a rapid rate. Without an aggregate increase in domestic rice production to meet demand, real prices are likely to be more susceptible to global price changes and to exchange rates and trade policies as imports rise.

It is possible that the national price trends presented in Figure 2.4 mask rural/urban differences and that price changes may have different welfare implications for urban and rural households. There are few regional markets with complete time-series data for rice prices in Nigeria; no data exist for rural markets. Among regional markets, the Enugu market (located in the South East zone of the country) has detailed time-series data of monthly rice prices from 2006 to 2012. We used these series data to represent rice price trends in urban Nigeria. The price trends in the Enugu market for the average weekly prices of various types of rice in the 2006 to 2012 period are presented in Figure 2.5.

The trends in Enugu shown in Figure 2.5 display similar patterns to the national price averages that are shown in Figure 2.4. While there is a general downward trend in the prices of all types of rice, the decline was not smooth. Changes in Enugu rice price also follow changes in the international price of rice very closely. The weekly price of imported rice in Enugu, similar to the average price of imported rice at the national level, is generally higher than the average price of all types of domestic rice.

Explaining the Demand for Rice in Nigeria

The food consumption pattern of Nigerian households has been undergoing significant changes with income growth, rapid population growth, changing relative prices of items in the food basket, changes in livelihoods, and urbanization. The Nigerian diet has consistently shifted away from tubers such as yams and cassava to cereals such as rice, to the extent that today rice commands the largest share of the average household's food budget. In this section, we model the demand for rice in Nigeria in an attempt to understand what drives the growing demand for the product and to understand what policy options are available to affect the demand for rice and to ensure food security for different segments of Nigerian society.

There are several ways to model the demand for rice or any food item. One can conceive of and focus on analyzing the demand for each individual food item. This allows a researcher to control for several covariates that affect the quantities of a food item purchased by households and thus provide a rich set of environmental controls, as well as policy tools, for the policymaker. However, this approach ignores the interrelationship among goods in household budget decisionmaking, especially given that with a limited budget, increasing expenditure on one item affects the quantities of other items purchased by the household.

Alternatively, one can model the demand for food items as part of a system of demand for food or household expenditures. Given that the demand for these items is part of the household's expenditure on food (indeed part of the household's total expenditure on all goods), it may make sense to use the second approach—an approach that accounts for the interconnections among the various items in the consumer's food budget as well as the household's budget constraints. With low incomes and strictly binding food budget constraints, these interconnections may be very important for consumer well-being. While the systems approach models the interconnections among various items in the household consumption basket, its disadvantage is that it

is not able to provide a rich set of environmental controls of the determinants of demand, as the single-commodity approach does.

We take the systems approach in estimating the demand for rice in Nigeria, using the Linear Expenditure System (LES) approach popularized by Stone (1954). The LES demand system models household expenditure shares on various commodity groups as a function of prices of these commodity bundles and consumer budgets. It is derived from maximizing the consumer's Stone-Geary utility function subject to the consumer's expenditure constraint. The LES model divides the consumer's expenditure shares on any commodity into two components: minimum required consumption/expenditure (which we call subsistence consumption) and additional expenditure shares over and above subsistence expenditure.

A summary of the LES model is as follows, with accompanying details of the model in Appendix B: Maximize $U = \prod_i (Q_i - \gamma_i)\alpha_i$, subject to $\Sigma_i p_i * Q_i \leq Y$, where U is the index of consumer utility, Q_i is quantity of good i, γ_i is the subsistence consumption of good i, α_i is the marginal budget share (MBS) of good i in the consumption basket, p_i is the price of good i, and Y is the consumer's total expenditure (budget). From the first-order conditions for utility maximization, subject to the expenditure constraint, and rearranging, we derive the estimation equation

$$S_i = \frac{p_i \alpha_i (Y - \Sigma p_j y_j)}{p_i Y_j} + \frac{\alpha_i}{Y},$$

where S_i is the expenditure on a good as a share of total household expenditure and all other variables are as defined in the text above.

Besides the ease of estimation, the LES model of demand has several attractive features. Because it is derived from a utility function, the parameter estimates have easy economic interpretation. It also satisfies the requirements of a demand function; among them, increasing all prices and incomes by the same proportion leaves quantity purchased (expenditure shares) unchanged, and the weighted expenditure shares of all commodities add up to unity. However, the LES model also has some disadvantages. The primary disadvantages are that it requires all commodities in the consumption basket to be noninferior and that consumer preferences be additive, hence independent in commodity bundles.

In our model, we treat the household as the unit of analysis. While economic theory models consumption decisions at the individual level, we were unable to do so because we have consumption and budget data only at the household level. However, this constraint ought not bias the results in the

analysis significantly, as most consumption decisions in Nigeria are made at the household level, typically by the patriarch/matriarch of the household.

The data for estimating the share equations in the LES model were obtained from the LSMS–ISA (2011), which is a national survey on household welfare conducted by the NBS in partnership with the World Bank. The data used in the analysis are from a 5,000-household cross-section survey derived from the larger nationally representative sample of 22,000 households. Although the geographical domain of analysis is Nigeria's six geopolitical zones, the data are nationally representative as population weights are included for the sample households.

All the findings in this chapter are derived using these population weights. The sample of 5,000 households represented in the data was surveyed twice—once in 2010 and once in 2011—to gather detailed data on agricultural activities and household consumption. Post-planting (lean season) data were collected in 2010, and postharvest data were collected in 2011. However, because of many extremely large and unrealistic outliers in the 2010 data, the analysis in this chapter is based on the 2011 postharvest data.

The LSMS–ISA data contain information on cassava and cassava flour; however, we chose to aggregate both into a single category for simplicity. Where an observation was three standard deviations away from the mean, we excluded it from the analysis to avoid undue influence on parameter estimates. Sample statistics for the data are presented in Table B.1 in Appendix B. As is shown in Table B.4, Nigerian households, on average, spend about 6.6 percent of their budgets on rice. This average budget share, however, has a large variance. There are clearly regional and rural/urban differences in average expenditures on rice in the sample, but nevertheless all show the importance of rice in the Nigerian diet.

Estimates of Expenditure and Demand Elasticities

We present the results of the estimates of the budget share equations for rice (total), imported rice, and local rice as a share of a household's total expenditures. This includes both ABS and MBS, describing the average expenditure share for rice and the additional expenditure on rice following a small change in income, respectively. We begin this subsection by discussing the budget shares, followed by a discussion of price and expenditure elasticities, which describe the sensitivity of a household's demand for rice due to a small change in price and expenditures, respectively. We do this first at the national level, and for comparative purposes only, we also report the estimates for dining out. Because we are interested in the effects of policy on different groups of people, we also present and discuss the budget shares and elasticities of demand for rural and urban households, as well as by income classes.

DEMAND CHARACTERISTICS AT THE NATIONAL LEVEL

The national average budget shares and marginal budget shares, expenditure elasticities of demand, market prices of rice, average household expenditures on rice, subsistence consumption of rice, and subsistence consumption of rice as a proportion of total household expenditure are presented in Table 2.6. For the purposes of comparison, we also present data for the food expenditures with the largest ABS and MBS, which is dining out. Generally, column 5 in the table indicates that the average Nigerian household spends more on domestic rice (273 versus 203 naira, or about 34.5 percent more) than on imported rice, in absolute terms.

Table 2.6 also shows that the average budget shares of all rice, local rice, and imported rice are relatively high. While the ABS for local rice is higher than that for imported rice, the marginal budget share for imported rice is higher than its local rice counterpart. While the average budget shares of all rice, local rice, and imported rice are relatively high, their marginal budget shares are lower than their ABS, suggesting that, on average, Nigerian consumers devote less of their additional budget to rice. In summary, at the national level households will devote a decreasing share of extra expenditure to rice as a whole, with even smaller shares being devoted to local rice purchases. This suggests that the share of household expenditure devoted to rice purchases will decrease with income, even though the total amount the household spends on rice will increase. For comparison, the MBS for dining out is higher than the ABS, suggesting that Nigerian consumers in all groups will devote a larger share of additional expenditure to dining out as incomes rise.

One of the major strengths of the LES approach is that it allows the researcher to estimate the proportion of expenditures that is considered as subsistence consumption (Appendix B). This is the amount of consumption expenditures the consumer is "committed to" without regard to his or her level of income.[9] Column 5 of Table 2.6 presents the average household expenditures on the various types of rice, while column 6 presents total subsistence consumption for various commodities (referred to here as gamma). Generally, the level of subsistence expenditures on different kinds of rice in Nigeria is very high. Indeed, column 7 shows that subsistence consumption as a share of average household expenditure on various types of rice ranges from a low of 55.8 percent (imported rice) to a high of about 78 percent (local rice).

9 This concept of subsistence consumption differs from the traditional meaning of subsistence, which refers to farmers growing enough to feed themselves rather than selling their produce in the market. Also see a discussion of this concept in Appendix B.

It is also interesting to note that the share of local rice that is for subsistence consumption is far higher than the subsistence share of imported rice. On the other hand, the subsistence share of expenditure on dining out is only 19.4 percent compared to 78 percent for local rice. Policies that affect the subsistence level of purchases may have serious welfare implications for consumers who spend a large part of their household budgets on these goods, especially for those at the low end of the income distribution (i.e., the poor).

Column 3 of Table 2.6 presents the estimated expenditure elasticities of demand for the country as a whole for all rice, local rice, imported rice, and dining out. The estimated expenditure elasticities are positive and significantly different from zero, at a 99 percent confidence level, indicating that all rice, imported rice, and local rice in the demand system are normal goods whose consumption increases with income. We note that the expenditure elasticity of demand for imported rice is much higher than that of local rice; in fact, it is twice as high. This suggests that, ceteris paribus, the share of expenditure on imported rice will grow at twice the rate of that on local rice as total household expenditures (or incomes) grow.

Although the estimated expenditure elasticities of demand are positive for all types of rice, they are significantly less than unity, suggesting that expenditures on rice in Nigeria will grow at a slower pace than household expenditures, ceteris paribus. Stated another way, the results indicate that while the absolute amount of expenditure on rice will increase with total household expenditures, the percentage spent on all rice, local rice, and imported rice will decrease as total household expenditures increase, if all other factors remain unchanged. The decreased expenditure shares are consistent with the decreasing MBS of these goods noted above; they are also consistent with Engel's law: the general observation that expenditure on food proportionally decreases as income increases.

DEMAND CHARACTERISTICS OF URBAN VERSUS RURAL HOUSEHOLDS

It is possible that there are differences in the patterns of consumption between urban and rural areas and that the national averages presented in Table 2.6 mask such differences. Table 2.7 presents the budget shares, expenditure elasticities, and average household and subsistence expenditures. The table also shows, for both rural and urban areas, the ratios of subsistence expenditures to average household expenditures. Panel A presents the estimates for urban households, while Panel B presents these for rural households. Generally, urban households spend about twice as much on imported rice as they do on domestic rice, while the reverse is true for rural households, as shown in

TABLE 2.7 Household budget shares and expenditure elasticities, rural and urban locations

Commodity	(1) Average budget share (%)	(2) Marginal budget share (%)	(3) Expenditure elasticity	(4) Market price (naira)	(5) Average household expenditure (naira)	(6) Value of gamma[a] (naira)	(7) Share of gamma in expenditure (6)/(5) (%)
Panel A: urban							
All rice	5.6	2.4	0.42				
Local rice	1.8	0.4	0.20	96	176	158	89.8
Imported rice	3.8	2.0	0.53	154	364	268	73.6
Dining out[b]	12.8	20.2	1.58	921	1,217	253	20.8
Panel B: rural							
All rice	7.1	5.5	0.77				
Local rice	4.7	3.0	0.72	92	288	196	68.1
Imported rice	2.4	2.5	1.03	178	144	70	48.6
Dining out[b]	9.3	14.1	1.51	679	573	140	24.4

Source: Linear Expenditure System model results.

Note: [a] Gamma represents the part of expenditure for subsistence consumption of food. [b] The market price of dining out here represents the average cost of dining out for a family of four. The average total household expenditure on dining out is low relative to the price of dining out, suggesting that most households do not dine out.

column 5. The expenditure share on rice that is treated as subsistence consumption, in column 7, is much higher for urban households than for rural households; as much as 90 percent of the expenditure on local rice by urban households is considered to be subsistence, while only 68 percent of such expenditures are considered to be subsistence by rural households.

Also, while the MBS for local rice is relatively low among urban households (0.4 percent), it is quite high among rural households (3.0 percent), as shown in column 2. For imported rice, the MBS is slightly higher among rural households than urban households: 2.5 versus 2.0 percent, respectively. This indicates that in general, rural households devote a larger portion of additional expenditure to rice than do urban households. The implication for rice demand in Nigeria is that the expenditure on rice will grow faster among rural households than among urban households if rural and urban incomes continue to grow at the same rate. This is especially true for local rice.

The estimated pattern of consumption shown here may indicate that while urban households treat all types of rice as subsistence food, rural households may treat rice differently; they treat imported rice as a suprasubsistence food, while treating local rice as subsistence food (see how much less of rural households' subsistence consumption is spent on imported rice than local rice in

Table 2.7). As in Table 2.6, the marginal budget shares of additional expenditure on rice of all types are generally lower than the average budget shares among both urban and rural households.

The estimated expenditure elasticities for rice are presented in column 3 of Table 2.7. In general, the expenditure elasticities of demand for rice are positive for both rural and urban households and suggest that the demand for all types of rice increases with household expenditures in both rural and urban areas. For urban households, the expenditure elasticities for all types of rice (all, local, and imported) are significantly less than 1, suggesting that they are necessities. For rural households, the expenditure elasticity of demand for imported rice is slightly greater than 1, while for local rice it is significantly less than 1. These estimates suggest that while local rice is considered a necessity by both rural and urban households, imported rice is considered a necessity by urban households only; it is considered a luxury item by rural households.

For the purpose of comparison, the ABS for dining out is 12.8 percent and the MBS is 20.2 percent for urban households, while the expenditure elasticity is 1.58. For rural households, the ABS for dining out is 9.3 and the MBS is 14.1 percent, while the expenditure elasticity is 1.51. It is clear from these estimates that the expenditure share of dining out will increase for both rural and urban households with increased household expenditures. Similarly, the expenditure share of imported rice will increase for rural households as total household expenditures increase.

The responsiveness of quantity demanded to changes in the price of a particular type of rice—own-price elasticities of demand, hereafter—is presented in Table 2.8: for local rice and imported rice; and for Nigeria as a whole and for urban and rural areas. As in other tables, we present own-price elasticities of demand for dining out for comparison with the elasticity of demand for rice.

Generally, the own-price elasticities of demand for these products are negative, suggesting that budget shares decrease with increased prices, ceteris paribus. However, the absolute values of the elasticity coefficients are generally

TABLE 2.8 Household own-price elasticities of demand

Commodity	(1) National	(2) Urban	(3) Rural
Local rice	−0.39	−0.13	−0.33
Imported rice	−0.64	−0.34	−0.46
Dining out	−1.11	−1.02	−0.68

Source: Linear Expenditure System model.

less than 1 at the national level, and for both rural and urban areas, suggesting that the expenditures on these food items are not very sensitive to price changes. Another way of putting it is that consumers will simply spend more, as the quantity demanded changes little as a result of an increase in price.

Note that demand is less price elastic in both the urban and rural sectors compared to the national level. This is possibly because national-level estimates may also reflect the movement of consumers between urban and rural sectors, each of which exhibits different demand characteristics. Generally, the own-price elasticities of demand for all types of rice are much lower for urban households than for rural households, suggesting that the demand for rice is less sensitive to price changes among urban households than among rural households.

The welfare implication of these low price elasticities is that households (both urban and rural) may spend more on rice (both domestic and imported) when prices go up, as they may be unwilling to substitute away from rice products with the price increases because rice is the preferred staple. In contrast, they would be more willing to substitute away from dining out if food prices in local eating establishments rise given a higher own-price elasticity of demand for dining out in both urban and rural areas.

One policy instrument often used in Nigeria to stimulate rice production and substitute the consumption of local for imported rice is an import tariff. However, this will work if and only if there is a high degree of substitutability between imported and locally produced rice that is derived from estimates of cross-price elasticities of demand among the two types of rice and others in the market. Estimates of all own-price and cross-price elasticities of demand for domestic and imported rice and all other food commodities are presented in Table B.2 in Appendix B.

In addition to the generally low own-price elasticities of demand presented in Table 2.8, the estimated cross-price elasticities of demand between local and imported rice as well as between rice and other local food staples, as reported in Table B.2, are very low—indeed, in no case does the absolute value of the cross-price elasticity of demand approach 0.05.[10] The estimated cross-price elasticity of demand between local and imported rice is −0.003, suggesting that while these types of rice are complements in consumption, the degree of complementarity is so low that the relationship among the two is not economically significant. Clearly, however, the two types of rice are not substitutes.

10 The full range of cross-price elasticities of demand is not reported in the text but is available in Appendix B. We report only the cross-price elasticities between local and imported rice.

The lack of substitutability between imported and local rice we find here is similar to what Demont et al. (2013) find for Senegal. Similarly, the cross-price elasticities of demand between rice and other domestic food staples is very low. Perhaps the lack of substitution between the two types of rice, as well as between those two types of rice and other food staples, explains the low own-price elasticities of demand, as there appears to be no effective substitutes for these types of rice in Nigeria. Besides consumer welfare implications, the lack of substitution between local rice and imported rice has important policy implications. Unless consumers develop a taste for local rice that rivals their taste for imported rice, it will be difficult to achieve rice self-sufficiency (no rice imports, as the government defines it) through a tariff strategy because there will always be demand for imported rice. Of course, there can be policies (including marketing and information campaigns) and incentives put in place to improve the quality and taste of local rice to rival those of imported rice.

DEMAND CHARACTERISTICS ACROSS INCOME GROUPS

So far we have analyzed the income and price elasticities of demand for rice for average national, rural, and urban households, but it is possible that expenditure patterns vary systematically among different groups of consumers, especially among income classes. If policy changes have disproportionate effects on the prices of foods consumed by households that are least able to withstand price shocks or least able to substitute away from such goods, these households may be the ones that will bear the brunt of the negative effects of such policy changes. It is therefore important for policy purposes to investigate the pattern of consumption among various income groups.

We therefore estimate price and expenditure elasticities of demand for rice, including the ABS and MBS values, for households among two different income classes—poor and rich—in both urban and rural areas. We chose to use this broader definition of income classes because of the limited sample size of the LSMS–ISA (2011). Although an ideal breakdown of household incomes is to subdivide the sample of households into quintiles, doing so by urban and rural population as well produced unreliable parameter estimates for each subgroup in the LES regressions due to small sample sizes.

Instead, we found the results to be more statistically significant when the data were aggregated into two income classes. We defined the poor as belonging to the lowest three income quintiles, while the rich were defined to be in the upper two quintiles. This definition is also consistent with the actual poverty headcount ratio of 62 percent of households earning less than US$1.25

TABLE 2.9 Household own-price elasticities of demand by urban and rural location and income class

	Urban		Rural	
Commodity	(1) Poor	(2) Rich	(3) Poor	(4) Rich
Local rice	−0.52	0.00[a]	−0.24	−0.11
Imported rice	−0.32	−0.19	−0.28	−0.35
Dining out	−0.35	−0.91	−0.31	−1.05

Source: Linear Expenditure System model results.

Note: [a]The own-price elasticity of local rice for urban rich was very close to zero and statistically insignificant.

per day, adjusted by the purchasing power parity (World Bank Development Indicators 2014).[11]

Table 2.9 presents the own-price elasticities of demand estimated for the rich and the poor households, according to our definition of the poor, and in both rural and urban areas. Columns 1 and 2 in the table present the own-price elasticities of demand for urban households by income class, while columns 3 and 4 present these for rural households.

There are two important results to observe. First, generally the own-price elasticities of demand are low in both rural and urban areas and among the two income classes (poor and rich). This implies that the conclusions drawn from Table 2.8 earlier apply to both income groups as well: demand for rice is not sensitive to changes in own-prices and household expenditures, for rice will naturally move in the same direction of the price change.

Second, while inelastic overall, the demand for rice is generally more price elastic for the poor, except for imported rice among the rural poor. The opposite is true for dining out, with higher own-price elasticities among the rich in both rural and urban households. This implies that the poor tend to be more affected by rice price changes than by prices for dining out. On the other hand, the richer households are more affected by prices for dining out.

Table 2.10 presents expenditure elasticities of demand broken down by the two income groups in urban and rural areas. Columns 1 and 2 present the estimates for the poor and the rich among urban households, while columns 3 and 4 present those for rural households. In general, the expenditure elasticities of demand for imported rice tend to be higher than for local rice among

11 At the time of this writing, 2010 was the most recent year for which data on poverty rates in Nigeria were available.

TABLE 2.10 Household expenditure elasticities of demand by rural and urban location and income class

	Urban		Rural	
Commodity	(1) Poor	(2) Rich	(3) Poor	(4) Rich
Local rice	1.41	0.00[a]	0.86	0.17
Imported rice	0.92	0.26	1.06	0.57
Dining out	1.00	1.29	1.16	1.67

Source: Linear Expenditure System model results.

Note: [a]The expenditure elasticity of local rice for urban rich was very close to zero and statistically insignificant.

both rural and urban households, confirming again that the results of the expenditure elasticities in Table 2.7 apply to both income groups. The only exception is for the urban poor, whose expenditure elasticity for imported rice is less than that for local rice.

Expenditure elasticities are generally higher for the poor. Among urban households, the expenditure elasticity of demand for rice (both local and imported) tends to be higher for the poor than for the rich (1.41 and 0.92 versus 0.00 and 0.26). The pattern is similar for rural households (0.86 and 1.06 versus 0.17 and 0.57). For the poor in general, expenditure shares on imported and local rice increase with total expenditures. The reverse is true for dining out: expenditure elasticities of demand are higher for the rich in both urban and rural areas.

Table 2.11 shows the corresponding ABS and the MBS values of local rice and imported rice for all income groupings in both rural and urban areas. Generally, poor households devote a larger share of their budgets to rice than richer households do in both rural and urban areas (total ABS of local and imported rice). Urban households tend to allocate a higher budget share to imported rice than local rice, irrespective of whether they are poor or rich. On the other hand, poorer rural households allocate a much higher share to local rice (5.7 percent versus 2.0 percent). Among the rural rich, the shares are evenly split between imported and local rice.

Overall, at the national level, poorer households spend far higher shares of their budget on local than imported rice (5.3 percent versus 2.5 percent, respectively). These poor households not only have a larger ABS, they also tend to have a larger MBS for rice, especially local rice, than the richer households. Rural households tend to have higher ABS and MBS for local rice than urban households, confirming the greater preference of rural households for local rice than urban households, as discussed earlier.

TABLE 2.11 Household average and marginal budget shares by rural and urban location and income class

	Urban		Rural	
Commodity	(1) Poor	(2) Rich	(3) Poor	(4) Rich
Panel A: marginal budget shares (MBS) (%)				
Local rice	4.8	0.0[a]	4.9	0.5
Imported rice	3.9	0.8	2.1	1.6
Dining out	7.6	20.9	10.3	21.3
Panel B: average budget shares (ABS) (%)				
Local rice	3.4	1.0	5.7	2.8
Imported rice	4.2	3.2	2.0	2.8
Dining out	7.6	16.2	8.9	12.8

Source: Linear Expenditure System model.

Note: [a]The MBS for local rice for urban rich was very close to zero and statistically insignificant.

In addition, rich households do not increase their expenditures on local rice as their total expenditure increases (indicated by the very low MBS values). Therefore, rich urban households treat local rice almost like an inferior good. Depending on the income status of the household, this has important implications for household welfare, as an increase in the price of rice will hurt poorer consumers the most in both urban and rural areas by forcing them to spend an even greater proportion of their meager incomes on rice. On the other hand, decreasing the price of rice will benefit these lower-income households the most, as it will allow them to buy the same quantity of rice at a lower cost.

The combined analysis of price and expenditure elasticities, as well as budget shares, emphasizes the greater vulnerability of poorer households to rice policy changes and thus their welfare with regard to income. Because poor households spend a larger share of their additional expenditure on rice than do rich households, they are more likely to suffer much larger welfare losses from increased rice prices than rich households would. Although demand for rice by low-income households is more price elastic than rich households, demand is sufficiently price inelastic for all households that total expenditure on rice increases for all households as a result of a rice price increase.

Increasing the price of rice can have adverse effects on food consumption baskets and therefore the well-being of households. On the other hand, policies that decrease the price of rice will benefit the poor the most, as they

will spend less to get the same quantity of rice. Such findings emphasize the importance of estimating these more disaggregate elasticity parameters for informing rice-pricing policies rather than those estimated without taking into account their location or income status.

Conclusion

This chapter analyzes the consumption of and demand for local and imported rice in Nigeria. We find that rice has become the most dominant food staple, at least by value, in the Nigerian diet in a relatively short period of time. Rice accounts for about 6.6 percent of the average Nigerian household budget. About 84 percent of Nigerian households eat rice regularly, consuming both locally produced and imported rice.

Although most Nigerians consume and demand both local and imported rice, there are regional and other locational differences in the pattern of rice consumption in Nigeria: urban households tend to consume more imported rice, while rural households tend to consume more local rice. More local rice is consumed in the northern zones of Nigeria than in the southern zones. While a small proportion of the rice consumed in Nigeria is grown on people's own farms (about 20 percent of local rice consumed and about 10 percent of all rice consumed in Nigeria), most of the rice consumed in Nigeria is purchased on the market.

The rapid increase in rice consumption in Nigeria has been in part determined by increased per capita income, urbanization and the lifestyle changes it engenders, decreases in the relative price of rice, and the rapid increase in total population. Rice consumption suits lifestyle changes that include both spouses working outside the home: it is easier and faster to prepare compared to other Nigerian staples, such as cassava or yam.

The regional as well as the rural urban difference in the consumption of local and imported rice is dictated, among other things, by differences in diet and customs: northern rural households prefer local rice that absorbs a lot of water so it can be made into sticky balls for local dishes, while urban dwellers prefer the parboiled long-grain rice that can be used for foreign dishes.

An estimated model of the demand for rice in Nigeria shows relatively high ABS and MBS for both local and imported rice, although there are differences in the composition of rice consumed across regions: ABS and MBS for local rice are much higher for rural households than for urban households, while average and marginal budget shares for imported rice are higher for urban households. For both rural and urban households, we find that a very large

portion of rice consumption can be considered a subsistence expenditure on both local and imported rice.

Expenditure elasticities of demand for both local and imported rice are positive, but they are generally less than 1 for urban households. For rural households, the expenditure elasticity for local rice is less than 1, but the expenditure elasticity of demand for imported rice is greater than 1. These expenditure elasticities indicate that the consumption of both imported and local rice will continue to grow, especially with continued rapid population growth. The estimates, however, also suggest that household expenditure shares for rice will decrease as total expenditure rises.

Estimated own-price elasticities of demand are very low, generally far less than unity, indicating that the demand for both local and imported rice does not respond very much to price changes. The implication is that household expenditures on rice will increase when the price of rice increases and will decrease when the price of rice decreases. This has welfare implications for the average Nigerian consumer. In addition to low own-price elasticities of demand, the estimated cross-price elasticity of demand for local and imported rice is very low, indicating low substitutability between the two types of rice.

An increase in the price of imported rice may not necessarily translate into increased demand for domestic rice and vice versa. This has important implications for rice policy in Nigeria, especially as it relates to rice trade policy. We will come back to this in Chapter 7. In addition to low elasticities of substitution between local and imported rice, there is also low substitutability between both types of rice and local food staples.

Besides low expenditure and price elasticities at the national level, there are differences in the structure of demand for rice across the rural–urban divide and across income groups. We find that ABS and MBS for local rice among low-income groups are much higher than they are for higher-income groups. The average and marginal budget shares for local rice as well as the subsistence component of rice expenditures are particularly high for urban poor households. At the same time, the poor households are more sensitive to price changes. These facts suggest that the poor are likely to be hurt the most by policies that result in increased rice prices, while they are likely to benefit the most from policies that lead to reduced rice prices.

In summary, several key messages emerge from the demand analysis we conducted in this chapter. First, rice has grown to become one of the most important staples in the Nigerian diet in a relatively short period. Given income and population growth, rapid urbanization, and lifestyle changes, the demand for rice will continue to grow at a rapid pace. A large component

of rice consumed in Nigeria is for subsistence consumption, and therefore changes in rice prices have important implications for food security in the country.

Second, local rice and imported rice are consumed for different purposes and are therefore not easily substitutable for each other. The estimates from the LES confirmed that the cross-price elasticity of demand between the two types of rice is very low. Third, using prices to change the type of rice Nigerian consumers buy is not likely to be successful, as it will require an unreasonably large price differential to work—a price differential that may not be politically feasible to bring about.[12] Fourth, simply focusing on increasing the supply of local rice through higher prices will only hurt low-income groups, as a large component of a poor household's rice expenditures is for subsistence.

Finally, an important policy implication is that there is good reason to improve the competitiveness of local rice brands and generate information and marketing campaigns targeted at and promoting their consumption in Nigeria. In this regard, there are some interesting lessons that can be drawn from existing niche rice markets in Nigeria, such as the illustrated case study of *ofada* rice. We now tackle the broader issue of how Nigeria can improve the competitiveness of local rice by examining in more detail the challenges and opportunities for transforming the rice sector in Nigeria in the next four chapters.

12 In the spring of 2014, the Nigerian government had to drastically decrease tariffs on rice imports, imposed earlier to promote the substitution of domestic for imported rice, due to increased smuggling of imported rice to avoid the high tariff. See Chapter 7 for a detailed discussion of recent rice tariff policy in Nigeria.