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Research Article

Food Expenditure Pattern of Household in Delta State, Nigeria: Economic Rationality Essentials

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ABSTRACT

Parametric utility model that predicts preferences of heterogeneous food consumers is flawed with issues of economic rationality. Using axiomatic preference indexes on food data from 459 household selected from a three-stage sampling procedure, the aim of the study was to check whether a finite set of price and demand observations made on household consumers in Delta state is rationalizable by some form of utility maximization that is common across all households. The study found heterogeneity in food consumption behaviour with evidence against rationality in utility maximization for food expenditure choices at Afriat Efficiency Index (AEI) of unity, violating the GARP, SARP, SGARP, HARP and CM outside the optimum AEI of between 0.536 and 0.982 inclusive. In three of the four food choice categories, households had below the Varian AEI threshold of 0.95. Particularly, household expenditure behavior in the State violated the GARP axiom of revealed preference at 0.018, 0.07, 0.104, 0.05, and 0.081 severity of violations for food in general, protein, carbohydrate, fats and oil, and fruits and vegetables sub-food categories respectively with 5-45% of inconsistent household behaviour. At AEI of unity, 14.30%, 4.79%, 11.43% and 45.04% of the households failed the zero tolerance in the carbohydrate, protein, fats and oil, and fruits and vegetables categories respectively. Only about three to six revealed preferences were found necessary to fully rationalise observed food expenditure choices in the State. Thus, not only are households irrational in utility maximization, there is unstable preference in food demand. Therefore, there is, in the aggregate, no exact one continuous, strictly increasing, piecewise strictly concave, skew-symmetric, and/or homothetic preference function that would completely rationalize households food consumption behaviour in Delta state.

1. Introduction

Consumption patterns contribute greatly to the social and economic policy of a country. For a developing country the consumption pattern is skewed towards food. In Nigeria, household expenditure on food and non-food items in 2019 was over ₦40 trillion with 56.5% spent on food items. Further analysis of food expenditure by households in 2019 showed that various foods consumed outside the home such as starchy roots, tubers and plantains, rice, vegetables, fish and sea food, grains and flours in that order were top in the list of household food items accounting for a combined 59.19% of food expenditure, 33.53% of total household expenditure on food and 24.8% of total household expenditure. Household expenditure on non-food items on the other hand were directed mostly at transport, health, education and services, rent and fuel and light, accounting for a combined 79.40% of non-food expenditure. Consumption pattern for Delta state in 2019 showed that the state had 48.08% non-food expenditure and 51.92% food expenditure in the total expenditure (National Bureau of Statistics, NBS, 2019). However, there are variations in the food consumption expenditure pattern across the country. These have been attributed to income of households and prices of food commodities subject to the demand that household food expenditure choice be explained by the theory only in terms of economic observables.

In Nigeria, household demand analyses have focused on functional forms which embody more general properties with respect to food prices and household income. Studies have determine household demand on the assumption of utility maximization that derived derivative-type conditions on demand functions that are implied by particular utility functional forms (Ojogho

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and Alufohai, 2010b; Ojogho and Ojo, 2017a; Ojogho and Ojo, 2017b; Colen *et.al*, 2018; Masters, *et.al*, 2018; Almås *et.al*, 2019) with the maintained hypotheses of integrability and global negative semi-definiteness of the Slutsky matrix. It is common practice that demand studies on micro-data may reject Slutsky symmetry either due to choice functional form, or no well-behaved form of preferences which rationalises the data on observed food prices and quantities. An important feature of demand data that calls for consideration is that it may be difficult to always find nice, well-behaved preferences that could have rationalised the observed choices (Polisson *et.al*, 2017).

In real life, preferences are not directly observable. Instead, they are discovered from observing household preferences behaviour on the assumption that those preferences remain unchanged while observing consume expenditure behaviour. Though, systematic aggregation of evidence is still surprisingly sparse, there is no reason to think *a priori* that observable economic parameters capture all the variation in preferences. Hence, the assumption that households are rational in the sense that they make choices as if they are maximizing some stable underlying utility function has been critically challenged over the last decades (Arkes *et al.*, 2016; Cason and Plott, 2014). So, modeling heterogeneity in food consumption behaviour, particularly with cycles of indifference, in a single utility maximization function that preserves theoretical consistency and tractability creates specification error. Here, the study asked how rational, in food expenditure choice-consistency, are households to revealed preference axioms, and how many canonical utility functions generate such choice behaviour in the event of inconsistency?

A nonparametric method presents an alternative way of providing answer to such question. The method has been used extensively in literatures (Varian, 1982; Fleissig and Whitney, 2007; Okrent and Alston, 2011). The essence of the approach consists in assessing the consistency of food expenditure data on price and quantity with the generalized (GARP), strong (SARP), and weak axioms of revealed preferences (WARP) (Bergtold *et.al*, 2004). Using nonparametric revealed preference analysis, it is possible to simultaneously test for both symmetry and negative semi-definiteness (Chambers and Echenique, 2016; Crawford and De Rock, 2014). The approach is in contrast to conventional econometric approaches, which typically adopt functional forms and restrict observed and unobserved heterogeneity *a priori*. Within the literature on demand for food in Nigeria, GARP and WARP have not been applied to demand for food. The study bridges the gap in empirical literature on food demand analysis in Nigeria.

Using household-level micro-data on observed food prices and quantities, the study examined household rationality consistency with utility maximization in Delta state, Nigeria. To achieve that, the study tested rationalizability of preferences for observed household food data on prices and quantities in the state, and determine minimum number of utility functions necessary to fully rationalise behaviour of households on food expenditure choices in the state. The purpose of the study is to test whether the food expenditure allocations selected by households are compatible with utility maximization taking a number of different forms without allowing any part of the consumer's expenditure to be "wasted". The results of the study shed light on caution in aggregating utility functions of household food demand in explaining household food data on price and quantity for policy thrust.

2. Methodology

The data for the study were drawn from a target population of households in Delta state, Nigeria. The State lies approximately between latitude 5°00' and 6°30' N and longitude 5°00' and 6°45' E with a total land-mass of 18,050 km^2 of which more than 60% is land. It is bounded in the north and west by Edo State, in the east by Anambra, Imo, and Rivers States, in the southeast by Bayelsa State, and on the southern extreme is the Bight of Benin that covers about 160 Km of its coastline. The state has three senatorial districts. The capital city is Asaba, located at the northern end of the state, with an estimated area of 762 km^2, while Warri is the economic nerve center of the state. The 2006 census puts the population of the state at 4,112,445 with males accounting for 50.3% of the population. Although the state is an oil producing State, yet agriculture dominates economic activities. The major agricultural food crops include cassava, rice, plantain, yam, sugar cane, groundnuts, and tomatoes, which are geared towards local and national markets.

A three-stage sampling procedure was used to select households in the state. The first stage used a simple random sampling to select two Local Government Areas (LGAs) from each senatorial district of the State. The LGAs were Ndokwa-east and Oshimili-South in Delta north, Warri-north and Bomadi in Delta-south, and Ethiope-west and Sapele in Delta-central. The second stage involved a simple random sampling three communities in each LGA from a sampling frame of communities in the respective LGAs. The communities were Aboh, Ibrede and Okapi-Oluchi in Ndokwa-east LGA, Asaba, Omeligbona and Ugbolu in Oshimili-South LGA of Delta-north senatorial district, Akugbene, Bomadi and Esanma in Bomadi LGA, Ogheye, Opuama and Tebu in Warri-north LGA of Delta-south senatorial district, and Irobe, Mosaga and Oghara in Ethiope-west LGA, Elume, Ikeransan and Oboba in Sapele LGA of Delta-central senatorial district of the state. The sample size for the study in each community was determined using the sample-size estimator of Krejcie and Morgan (1970) at 95% confidence interval and 0.05 degree of accuracy. The sample-size estimator is given as:

$$s_i = \frac{\chi^2 N_i P(1-P)}{d^2(N_i-1)+\chi^2 P(p-1)} \quad [1]$$

Where s_i is the sample size of the i^{th} community, N_i is the maximum target population proportion of the i^{th} community, $\chi^2{}_{0.05,1} = 3{,}841$, and $d = 0.05$. A household was identified by its household head which is usually the self-reported head. A simple random sample of households in each community was then taken from the target population developed from a pilot survey. The sample size were respectively 24 from Aboh, 28 from Ibrede and 19 from Okapi-Oluchi in Ndokwa-East LGA, 24 from Asaba, 28 from Omeligbona and 10 from Ugbolu in Oshimili-South LGA of Delta-North senatorial district, 52 from Akugbene, 36 from Bomadi and 28 from Esanma in Bomadi LGA, 32 from Ogheye, 48 from Opuama and 28 from Tebu in Warri-North LGA of Delta-South senatorial district, and 31 from Irobe, 26 from Mosaga and 23 from Oghara in Ethiope-West LGA, 31 from Elume, 39 from Ikeransan and 32 from Oboba in Sapele LGA of Delta-Central senatorial district of the state. That amounted to 133 households from Delta-North, 224 households from Delta-South, and 182 households from Delta-Central senatorial district of the state making a total sample size of 539 households for the study out of a target population of 588. Only 459 copies of questionnaire were retrieved from the households making a response rate of 85%. Household expenditure measures were on food, home grown food consumed, housing, clothing, education, health, transportation, communication, among other utilities, excluding irregular, one-time expenses arising from special occasions, repayments of loans other than house purchase mortgages, savings and taxes. Household consumption expenditure was scaled to take account of differing household size and composition (Donaldson and Pendakur, 2004; 2006), using a recommended scaling methods by Callan *et. al,* (1996) and O'Neill and Sweetman (1998). The weights were 1 for the first adult in the household, 0.7 for additional household members aged over 14 and 0.5 for household members aged less than 14. The prices of food commodities were measured as the sum of the transactions costs incurred by a household during purchase and the retail prices in naira equivalent per kg, while the quantity consumed of food commodities by a household was the quantities purchased at market price per kg. The study focused empirical analysis on consumption expenditure of households for carbohydrate, protein, fats and oil, fruit and vegetables aggregate food choices for the period of March-November 2018 in the state following the multistage budgeting.

Model Specification for Rationality Test

The study assumed that preferences of elementary food commodities within a sub-group are independent of the consumption of food items other than the sub-group. The empirical content of utility maximization model was particularly captured by $GARP$. The study tested whether observed household food data on prices and quantities, $(\boldsymbol{p}^t, \boldsymbol{x}^t)_{t=1,\ldots T}$, satisfied the Generalized Axiom of Revealed Preference (GARP) on a revealed preference characterization of the utility maximization model under full Afriat Efficiency Index (AEI) of Varian (1982). The data were then considered to have been generated by a single utility function that rationalizes all observed demands, otherwise no single utility function exists which explain the choices of all of the households. Failure to satisfy the full Afriat efficiency Index, however, the optimum Afriat efficiency Index (AEI) on a revealed preference characterization of utility maximization model under partial efficiency, $e < 1$ of Halevy *et al.* (2018) was computed. The fraction of *wasted* household expenditure was computed as: $overall\ inefficiency\ Index = 1 - \mathrm{e},\ \forall e: 0 < e < 1$ [2]

If the observed household food data on prices and quantities, $(p^t, x^t)_{t=1,\ldots T}$, for the set of household food items satisfy GARP at $0 < e < 1$, then it was concluded that $(p^t, x^t)_{t=1,\ldots T}$ are approximately consistent with utility maximization, and that there is an approximate single utility function which explains the choices of all of the households after allowing for optimization error, $1 - e$. The maximal value of e at which the data satisfy $GARP$ gave the extent to which to relax household budget constraint in order for the observed data on prices and quantities to appear to be consistent with utility maximization. A critical cost efficiency index or AEI of unity denotes perfect consistency: The index approaches zero as the behavior becomes more inconsistent and the budget needs to be reduced starkly to eliminate inconsistency (Nitsch and Kalenscher, 2020a).

The analysis was repeated for Weak Generalized Axiom of Revealed Preference (WGARP), Strong Axiom of Revealed Preference (SARP), Weak Axiom of Revealed Preference (WARP), Symmetric Generalized Axiom of Revealed Preference (SGARP), Homothetic Axiom of Revealed Preference (HARP), and Cyclical Monotonicity (CM). The degree to which the consumer fails to minimize expenditure was measured by the *violation index*, given as:

Violation index, $i^t = \frac{p^t x^s}{p^t x^t},\ \ i^t < 1$ [3]

Revealed preference restrictions were used on the observed household food expenditure choice as guide to form two-sided bounds on the minimal exclusive exhaustive partitions of the data. Crawford and Pendakur (2012) affirms that in a framework where finding the minimum number of types is important, unobserved preference heterogeneity is vastly more important than observed demographic heterogeneity. The data were analysed using the *revealedPrefs* R-package of Boelaert (2019) and *rpaxioms* Stata-package of Demetry, *et al.* (2020).

3. Results and Discussion

The expenditure pattern of households in the State is presented in Table 1. The results showed that monthly household expenditure on food and non-food items were

₦42321.26 and ₦130082.90 with food accounting for only about 25%, on average. First, with food occupying a small part of the budget, the households may not be considered as poor but implies that their budgets are more diversified. It suggests that their budgets can be said to be non-food-intensive.

Table 1
Expenditure and Budget Shares Pattern of Households in Delta State

Commodity	Expenditure (₦)	Budget share
Food	42321.26	0.245
Protein	12288.00	0.290
Carbohydrate	15301.43	0.362
Fats and Oil	6936.57	0.164
Fruits	7795.26	0.184
Non-Food	130082.90	0.755
Education	21651.81	0.167
Transportation	7290.80	0.056
Clothing	33045.71	0.254
Housing	34646.00	0.266
Others	33448.57	0.257

Source: Computed from Field Survey, 2018.

This may be attributed to increase in industrialization, commercialization, awareness of the importance of such institutions as formal education, as well as increase in the cost of transportation. Unrelatedly, within the food budget, about 36% was spent on carbohydrate food items, 29% was spent on protein food, followed by fruits and vegetables and least with fats and oil category. This suggests that the composition of household food budget contain more necessities and fewer luxuries. Thus, cheaper, more starchy foods seem to predominant in household food expenditure in the State. This is supported by Ojogho and Ojo (2017a). However, the budget share on food categories are approximately the same amounting to seemly diversified diets. This may be due to the emphasis that nutritionists place on the role of a balanced, or diversified, diet for good health. A related reason is that greater diversity is usually thought to be a good thing in and of itself, which possibly reflects a basic concavity of the utility function as opined by Clements and Jiawei (2017).

The results of the degree to which a household in the State departs from full economic rationality are presented in Table 2. The results showed that, on GARP, the mean AEI for food choice consumption associated with utility maximization is 0.982, which means that the average household's monthly budget on food needs to be reduced by about 2% in order for the data on quantity and price to be exactly rationalizable by utility maximization. In other words, the household is, on average, wasting about 2% of its monthly budget on food in departing from rationality in the form of utility maximization. Thus, a household in the state could have obtained the same level of utility by spending only the fraction (0.982) of what it actually spent to attain current level of utility.

The mean AEI for protein food category consumption associated with utility maximization was 0.930, which means that the average household's monthly expenditure on protein food needs to be reduced by about 7% in order for the household food data on quantity and price in the protein food category to be exactly rationalizable by utility maximization. In other words, there is, on average, a 7% waste of monthly expenditure on protein food by households in departing from rationality with utility maximization. The pattern is similar for fruits and vegetables sub-food category where the mean AEI for utility maximization is 0.930. For fats and oil sub-food category, the mean AEI was about 0.950, which means that the average household's monthly budget on fat and oil sub-food category needs to be reduced by about 5% in order for the data on quantity and price in the fats and oil sub-food category to be exactly rationalizable by utility maximization. This is the only sub-food category where households had the Varian AEI threshold of 0.95. However, the average household is wasting about 5% of its monthly budget on fats and oil food category in departing from rationality with utility maximization. This means that the same level of utility can be achieved by the households through a different combination of food commodities which costs strictly less at the prevailing market prices. It potents a household innate inability to distinguish among similar food bundles as opined by Dziewulski (2020).

Table 2: Rationality Status of Households Food Choice in Delta State

Food Category	Afriat Efficiency Index (AEI)						
	SGARP	WGARP	SARP	WARP	HARP	CM	GARP
Food	0.536	0.917	0.917	0.917	0.891	0.789	0.982
Protein	0.515	0.931	0.931	0.931	0.848	0.715	0.930
Carbohydrate	0.550	0.896	0.896	0.896	0.693	0.773	0.896
Fats and Oil	0.589	0.950	0.950	0.950	0.868	0.776	0.950
Fruits and vegetables	0.610	0.911	0.912	0.910	0.856	0.810	0.919

Source: Computed from Field Survey, 2018; values in parentheses are the *overall inefficiency Index*

The results also showed that the mean AEI for carbohydrate food choice category associated with utility maximization was about 0.896, which means that the average household's monthly budget on food needs to be reduced by about 10.4% in order for the data on quantity and price on carbohydrate food category to be exactly rationalizable by utility maximization. Households in the State are spending about extra 10% of its monthly budget on carbohydrate food in departing from rationality with utility maximization. It implies that about 90% of food expenditure choice on carbohydrate sub-food category by households is rationalizable by utility maximization. The margin between their present optimization level and the level of perfect (100%) efficiency of optimization in the carbohydrate food category is too wide to be attributed to measurement errors, but to optimization error. The results showed that food expenditure choice behavior of households is below the Varian (1991) AEI threshold of 0.95. The optimization error resulting in departure from rationality in the form of utility maximization may be due to the heterogeneity in budget share and food choices.

Households were least rational in the carbohydrate food choice category, and most rational in the fats and oil food choice category in the State. The results imply that without allowing for optimization error, the household consumption data in the State on quantity and price for food and sub-food categories violate the GARP axiom of revealed preference with 0.018, 0.07, 0.104, 0.05, and 0.081 severity of violations for food in general, protein, carbohydrate, fats and oil, and fruits and vegetables food categories respectively. Similarly, households were cost inefficient at the above respective values. For household food consumption data on quantity and price, for example, in Delta State to be exactly rationalizable by a utility maximization function, about 2% minimal expenditure adjustment is required in order for the data to comply with GARP. This agrees with Dean and Martin (2016) that shows that the minimal cost to make a revealed preference relation acyclic can be relatively small.

Optimum Afriat Efficiency Index of less than unity implies that there were violations of GARP in the household food choice data on price and quantity. Households in the state can be said to have wasted money, as they did not obtain the maximum subjective value for their money. The results also showed that the household food expenditure choice violated the SARP, SGARP, HARP and CM at Afriat Efficiency Index of unity. These imply that household food expenditure choice data in the State cannot be exactly rationalized by a continuous, strictly increasing and concave utility function that is symmetric, homothetic, or quasilinear. Thus, household behaviour on food expenditure choice is not of the maximizing behaviour. It is implied that the household food data on price and quantity in the State are not generated by household with stable preferences who was always choosing the best food expenditure choice they could afford. The violation can only be attributed to households not choosing the most preferred food expenditure choice alternative that was affordable given their budget, rather selecting another less preferred option. An alternative plausible explanation for the non-rationalisation is either the theory of utility maximization is wrong for these households, or tastes, food prices and household income have changed for the households in the State. It suggests a symptom of unstable preference in food demand by households in the State. The unstable preference could also be predicated on changes in information about the health consequences of diet.

Table 3 presents the results of the partitions of households in the State by revealed preferences. The results showed that the number of types needed to completely explain all observed variation in consumption behaviour of households is quite small relative to the number of observations in household food expenditure data on quantity and price of household food consumption. The results showed that about three revealed preferences for food, four for the protein category, five each for the carbohydrate and fats and oil, and six revealed preferences for fruits and vegetables categories of food demand in the State are necessary to fully rationalize all observed choices in a data set with 459 observations of price and quantity vectors respectively. This implies that there are a minimum of three, four, and six groups which maximize different utility functions of food, protein, and fruits and vegetables demand in the State to completely rationalize all the observed variation in food expenditure choice behaviour. The results imply that there is unobserved preference heterogeneity in food expenditure choice among households in the state. Thus, there is no indifference curve that could be drawn, in aggregate, for household in the state that would make food choice bundles maximizing bundles. Instead, all of the households within each group of revealed preference can be modelled as having a common well-behaved utility function such that within-groups, a single utility function is sufficient to rationalize all the observed household food expenditure choice behaviour. Hence, modelling strategies with a small number of discrete types might be better in explaining food consumption expenditure behaviour of households in the State. This is in line with De Clippel and Rozen (2018) that having all possible observations is necessary for assessing some models while the results change when it is not the case.

Table 3
Partitioning of Households in the State by Revealed Preferences in Delta State

Food Category	Number of Preference Types	
	Lower Bounds	Upper Bounds
Food	1 [140]	3 [171, 3, 1]
Protein	1 [171]	4 [136, 29, 9, 1]
Carbohydrate	2 [156, 160]	5 [120, 24, 16, 10, 4]
Fats and Oil	2 [151, 153]	5 [123, 31, 14, 6, 1]
Fruits and Vegetables	1 [89]	6 [101, 35, 19, 9, 3, 8]

Source: Computed from Field Survey, 2018; the number of lower and upper bounds are reported at efficiency level, $e = 1$.

The results of the number and percentage of violators in food choice by preference indicators are presented in Table 4. The results showed that 14.30%, 4.79%, 11.43% and 45.04% of the households failed the 1.00 tolerance for Afriat efficiency in the carbohydrate, protein, fats and oil, and fruits and vegetables categories respectively. These suggest that between 5-45% of households were inconsistent with GARP, and had Afriat Efficiency below 0.98. The results also imply that households had the least number of violations of GARP in carbohydrate sub-food choice category but highest number of violations of GARP in the fruits and vegetables food choice category in the state. Of the four food choice categories, households violated one or more of the revealed preference axioms. Of these, households in all food categories had violations at Afriat efficiency indices of less than unity, and three of those were below the Varian (1991) Afriat efficiency index threshold of 0.95.

Table 4
Households Violations of Revealed Preference in Food Choice in Delta State by Preference Axioms

Variables	Number and Percentage of Violations						
	GARP	SGARP	WGARP	SARP	WARP	HARP	CM
Carbohydrate							
Number of violators	4304	18661	220	4312	220	174	174
Percentage of violators	(14.30)	(61.64)	(1.46)	(14.32)	(1.46)	(100.00)	(100.00)
Protein							
Number of violators	1442	17642	86	1597	124	174	174
Percentage of violators	(4.79)	(58.27)	(0.57)	(5.31)	(0.82)	(100.00)	(100.00)
Fats and Oil							
Number of violators	3442	14343	189	3514	204	174	174
Percentage of violators	(11.43)	(47.37)	(1.26)	(11.67)	(1.36)	(100.00)	(100.00)
Fruits and vegetables							
Number of violators	13559	18471	362	13571	363	174	174
Percentage of violators	(45.04)	(61.01)	(2.41)	(45.08)	(2.41)	(100.00)	(100.00)

Source: Computed from Field Survey, 2018; number and percentage of violators are reported at efficiency level, $e = 1$.

4. Conclusion

Using household-level micro-data on observed food prices and quantities, the study examined expenditure pattern of rural households in the light of economic rationality consistency with utility maximization in Delta state, Nigeria. To achieve that, the study tested rationalizability of preferences for observed food data on prices and quantities of household in the State, and determine minimum number of utility functions necessary to fully rationalize the behaviour of households on food expenditure choices in the State. The study found heterogeneity in food consumption behaviour with evidence against rationality in utility maximization for food expenditure choice at Afriat Efficiency Index (AEI) of unity. Food expenditure Households in the State violated the GARP, SARP, SGARP, HARP and CM outside the optimum AEI of between 0.536 and 0.982 inclusive. In three of the four food choice categories, households had below the Varian AEI threshold of 0.95. Particularly, observed expenditure for food and sub-food categories in the State violated the GARP axiom of revealed preference at 0.018, 0.07, 0.104, 0.05, and 0.081 severity of violations for food in general, protein, carbohydrate, fats and oil, and fruits and vegetables sub-food categories respectively with 5-45% of inconsistent households. At AEI of unity, 14.30%, 4.79%, 11.43% and 45.04% of the households failed the zero tolerance in the carbohydrate, protein, fats and oil, and fruits and vegetables categories respectively. About three to six revealed preferences were found necessary to fully rationalize the observed food expenditure choices in the state. Another essential observation from the study is that households are heterogeneous in food consumption behaviour. Accounting for this unobserved heterogeneity in food choice behaviour of households will be a necessary part of understanding food choices in the State. Following economic rationality essentials, households in the State are irrational in utility maximization with unstable preference in food demand. Thus, that it is indeed not possible to capture household food expenditure choices in Delta state, in the aggregate, with exactly one continuous, strictly increasing, piecewise strictly concave, skew-symmetric, and/or homothetic preference function that completely rationalize households food consumption behaviour in Delta state.

Based on the findings, food suppliers should design their marketing strategies to address the needs of various consumer groups and food categories in the state. Similarly, policymakers should design policies that would achieve different effectiveness in different consumer segments *vis-a-vis* food categories rather than looking at food customers as a homogenous group. Food demand analysts would need to consider heterogeneity in empirical utility model specifications, both among food consumers and food categories, if they must use a single utility function.

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