

Argentine Beef Demand and Household Choices of Retail Channels

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ABSTRACT

Household choices of outlet retail channels in beef purchases depend on several characteristics related to the quality of the product, convenience and ease of purchase, and economic factors such as price, income and payment methods. The aim of this paper is to study the influence of demographic and socio-economic attributes in the choice made by Argentine consumers using a Multinomial Logit Model. The results show that the total number of purchases, the type of household, payment methods, and gender and schooling years of household head are the most relevant variables in the sample.

Keywords: Beef; Household Consumption; Multinomial Logit; Argentina

1 Introduction

Beef is the major type of meat consumed in Argentina, with an annual average per capita consumption of around 58 kilograms, far below the 80 kilograms of the '80s. Traditionally, butcheries and small supermarkets concentrated most of the retail sales.

However, a remarkable transformation process in the food retail sector occurred over the past two decades. While distinctive through different periods, the 90's marked an accentuated transnationalization with the strong presence of international food chains (Cicolella, 2000). Large super and hypermarkets competed with traditional businesses changing consumer buying habits.

Concentrating purchases in one place with a wide range of advertised products available turned out to be attractive to consumers. In this way traditional food retailers have been adversely affected by the competition, losing market share. It is estimated that seven chains* account for 43.4 per cent of Argentina's total food and beverages sales† (Chioda, 2010).

A similar trend was expected for beef sales, but it was not so. Despite the chains' gain in market share, butcheries continued to enjoy consumers' preferences, without information on the factors which influenced this selection.

The international literature highlights that consumer choice for a particular outlet depends on several factors, which are directly related to the quality of the marketed meat (tenderness, freshness, etc.). Among the most important are prices, variety of products, home's proximity, payment method, and the possibility to buy other goods in the same place (Halucinate et al., 2007).

*Includes Disco, Carrefour, Walmart, Cencosud, Coto, La Anónima, Casino Guichard-Parrachon.

†Total sales estimated at US \$ 25 billions.

In this way, butcheries may enjoy greater consumer confidence because they are perceived to offer mostly fresh and tender beef, a variety of cuts and are often located closer to consumers' homes. Therefore, consumers who evaluate these attributes highly, most likely select this outlet. On the other hand, supermarkets and hypermarkets make regular use of some beef cuts advertising, and are better equipped to attractively display the merchandise, have extended hours schedules, including Sundays, supply greater variety of products in the same place, and accept different forms of payments.

The changes in retail channels and the predominance of traditional butcheries as retail outlets highlighted the need to know its association in more detail. Understanding households' retail preferences according to their demographic as well as socio-economic characteristics may help to identify purchasing behavior to better serve their needs; to facilitate retailers' introduction of marketing innovations and take advantage of business opportunities; but not less important, for government to design adequate sector policies.

Despite the importance of the topic, no specific studies of this type have been found in Argentina. This paper intends to fill the vacuum. Considering that different characteristics influence households' choice of a retail channel, it aims to analyze the impact of demographic and socio-economic attributes in their selection. It is applied to Santa Fe province, the second largely populated Argentine Pampean province.

The paper is organized as follows. Next section focuses on materials and methods used to analyze household expenditure data. Then, estimated results of the Multinomial Logit model are showed. Finally, conclusions and implications of the results are presented.

2 Materials and Methods

To estimate the impact of households' characteristics in the choice of retail channels for beef purchases, a random utility model is proposed (Hensher et al., 2005). Here, the different channels are taken as mutually exclusive alternatives that households compare, choosing one of them in order to maximize their utility, once they decide to participate in beef consumption. Specifically, each alternative of purchase can be represented by a categorical variable j with $j = 1, \dots, J$ that covers all feasible retail channels.

For each retail channel j , the utility level of household i associated with this alternative can be decomposed into two components: a) a deterministic component (V_{ij}) that is a function of observed household characteristics, and b) a random part that reflects idiosyncratic tastes of i and unobserved attributes of j (ε_{ij}). It is generally assumed that these two components of the utility are independents and additives, so the utility of household i for alternative j can be written as

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (1)$$

Assuming that the set of socioeconomic and demographic characteristics observed and measured for a household are represented by a vector of K variables, the first component can be expressed in an additive way as follows

$$V_{ij} = \sum_{k=1}^K \beta_{jk} f_{jk}(X_{ijk}) \quad (2)$$

Where β_{jk} is the coefficient associated to the attribute X_{ijk} .

These coefficients show the relationship between each household characteristics and the level of utility derived from the particular retail channel choice for buying beef. The inclusion of the feature $f_{jk}(\cdot)$ indicates that the form that expresses the relationship between the attribute and the value can be different, either as linear, logarithmic, quadratic or through interactions between attributes.

From the assumption that households act rationally in the choice of alternatives, the choice probability for alternative j can be depicted as

$$p_{ij} = \Pr(U_{ij} \geq U_{il}) \quad \text{for all } l = 1, 2, \dots, J \text{ and } i \neq l \quad (3)$$

or

$$p_{ij} = \Pr(V_{ij} + \varepsilon_{ij} \geq V_{il} + \varepsilon_{il}) = \Pr(\varepsilon_{il} - \varepsilon_{ik} \leq V_{ik} - V_{il}) \quad (4)$$

If it is assumed that unobserved random components are independent and identically distributed with Gumbel extreme value type-I distribution, then the difference $\varepsilon_{il} - \varepsilon_{ik}$ has a logistic distribution (McFadden, 1978). So the equation (4) specifies the following Multinomial Logit Model:

$$p_{ij} = \frac{\exp(V_{ij})}{\sum_{l=1}^J \exp(V_{il})} = \frac{\exp[\sum_{k=1}^K \beta_{jk} f_{jk}(X_{ijk})]}{\sum_{l=1}^J \exp[\sum_{k=1}^K \beta_{lk} f_{lk}(X_{ilk})]} \quad (5)$$

In order to identify the parameters in the equation, we apply the normalization of $\beta_{1k} = 0$ for all $k = 1, 2, \dots, K$. The equation (5) can therefore be expressed in the following way:

$$p_{i1} = \frac{1}{1 + \sum_{j=2}^J \exp(V_{ij})} ; \text{ and for all } j = 2, \dots, J \quad \frac{p_{ij}}{p_{i1}} = \frac{\exp(V_{ij})}{1 + \exp(V_{ij})} \quad (6)$$

The model coefficients represent the effects of the household characteristics on the probability that household i selects retail channel j as opposed to a standard alternative (outlet 1) as the primary source.

Equation (6) can be estimated by a maximum likelihood method. The marginal effects of independent variables on probabilities can be obtained by $\partial p_j / \partial X_m$ if X_m is continuous or $\Delta p_j |_{X_m} = p_j |_{X_m=1, \bar{X}_m} - p_j |_{X_m=0, \bar{X}_m}$ for dummy variables. The standard errors of marginal effects are computed by the delta method (Hirschberg et al., 2008).

The data were obtained from the 2004-05 National Survey of Household Expenditures for Santa Fe province in Argentina. The sample consists of 1,755 households, of which 1,506 households have reported consumption of some beef cuts. At the same time, the survey included four groups of possible purchase outlets: a) supermarkets, b) butcheries, c) other places, or d) outlets not defined. Only 13 households bought beef in the last two channels and many households responded that they did buy in both of the first two channels (supermarkets and butcheries). Therefore retail channels c) and d) have been excluded from the study, leaving only a) supermarkets, b) butcheries, c) both of them. Thus, in terms of the model (6), we have $J=3$.

The independent variables included were chosen on the basis of previous studies (Bifaretti, 2008; Halucinate et al., 2007; Florkowski et al., 2002; Florkowski, Zhikang, and Huang, 1999) on household characteristics, as well as availability of variables collected in the survey. Household characteristics included gender (male and female (base)), schooling years[‡] (very low (base), low, medium, and high), household types[§] (unipersonal (base), nuclear, nuclear with children, and extended), age of household head (years), car ownership (with and without cars (base)), household size (number of members), and total household income (Argentine pesos). Further variables were taken into account such as the beef quantity purchased (kilograms), total spending in beef (Argentine pesos), and the payment methods (cash and credit (base)).

3 Results and Discussion

Butcheries have been the preferred retail channel for households which consumed beef in Santa Fe province, accounting by 65.01% (Table 1), followed by supermarkets (19.3%), purchases in both channels (14.81%), and only 0.87% in other outlets (slaughter houses, farmer markets, etc.). In total 99.13% of households beef purchases concentrated on the first two channels.

[‡] Schooling years: a) very low: includes household head without formal education or incomplete elementary school, b) low: elementary school and incomplete high school, c) medium: high school and incomplete college education, d) high: college education and more.

[§] Household includes: a) unipersonal: single member household, b) nuclear without children: married couple without children, c) nuclear with children: couple or single parents with children, d) Extended: with additional family and non-family members.

Table 1
Selection of Retail Outlets by Households

Retail Channels	Households	Percentage (%)	Cumulative Percentage (%)
Supermarkets	288	19.3	19.3
Butcheries	970	65.01	84.32
Supermarkets and butcheries	221	14.81	99.13
Other outlets	13	0.87	100
Total	1492	100	

Marginal and discrete effects of the variables included in the model are presented in Table 2. Estimated coefficients and their statistical significance are included in Table 3 (Appendix). Results indicate that an increase in the age of the household head leads to an increase in the likelihood of supermarket purchases, and decreases the likelihood of purchases in butcheries or in both channels at the same time. For example, the probability of buying in supermarkets increases by 0.26% within a year, while the probability of purchases in butcheries decreases by 0.11%. On the other hand, when households do not own a car the probability of purchases in supermarkets decreases by 2.39%.

Households show a greater probability of butchery choice over other channels when they increase the purchases in the quantity of beef. It is observed that when purchases of beef increase by 1 kilogram, keeping the rest of the variables in the sample average, the likelihood of butchery purchases increases by 0.48% while the likelihood of supermarket purchases decreases by 0.83%.

With regard to the types of households, and compared to a one-person household, the model reveals a rise in the probability of purchases in supermarkets for nuclear households, nuclear households with children and extended households by 6.82%, 3.53%, and 1.95% respectively. At the same time, nuclear households and extended households with children show a slight increase in the likelihood of butchery purchases as compared to one-person households.

The payment method has a very significant effect on the probability of retail choice. The probability of butchery purchase is 16.86% higher if payments are made in cash compared to payments with credit/debit cards. In turn, payments in cash reduce the likelihood of selecting supermarkets by 18.14%.

The household head level of education has also an influence on the choice of retail outlets. Taking a household head with very low level of education as a reference, the probability of choosing a supermarket is 5.5% higher for household heads with low level of education, 19.46% for medium level of education, and 21.41% for high level of education. In addition, the probability of butchery purchases decreases as the level of education increases from very low level by, 12.43%, 31.46%, and 33.87% respectively.

The employment status of the household head and the household size has low impact on the probability of retail outlet selection.

Given the estimated results, they can be used to simulate the impact of the selected variables in the probabilities of outlet selection. For example, Figure 1 shows that the probability of buying in supermarkets decreases when the purchased beef quantity rises, independently of the payment method chosen by the household. Buying in butcheries and both channels increases in probability when the quantity increases.

Figure 1 also shows that the probability of purchases in supermarkets is higher when the household uses credit cards compared to cash. However, this difference is declining as the quantities of beef purchases increases. For example, if purchases are less than 2 kilograms per month, the probability of selecting the supermarket as a retail channel is 21% higher if payment is done with credit cards compared to cash.

With regard to the probability of butchery purchases, it is observed that it is higher if the payment is made in cash compared to the use of credit cards. The difference in probability is close to 20%, and it diminishes when beef quantity purchased by households is reduced.

Table 2
Estimated Marginal Probabilities of the Multinomial Model

	Supermarkets	Butcheries	BothChannels
Age of household head	0.0026	-0.0011	-0.0015
No car	-0.0239	0.0384	-0.0145
Male household head	-0.0134	0.0448	-0.0314
Quantity of beef	-0.0083	0.0048	0.0035
Expenditure on beef	0.0005	-0.0007	0.0002
Household income	0.0000	0.0000	0.0000
Extended family	0.0195	0.0111	-0.0306
Nuclear family	0.0682	-0.0375	-0.0307
Nuclear family with children	0.0353	0.0074	-0.0427
Cash payment	-0.1814	0.1686	0.0128
Low education of household head	0.0550	-0.1243	0.0693
Medium educational level of household head	0.1946	-0.3146	0.1199
High education of household head	0.2141	-0.3387	0.1246
Household head unemployed	-0.0226	-0.0070	0.0297
Household size	-0.0007	-0.0060	0.0067

In the selection of both channels, the probability of purchases by payment method does not present major differences. There is a small change in the selection likelihood if the payment is made in cash for the purchases of small beef quantities.

One of the main reasons for this behavior may be the fact that not all butcheries have the credit card electronic payment system, leaving only the cash option. Additionally, in some households payments are made in cash when they receive their weekly/monthly salaries.

Figure 2 links the educational level of the household head with beef quantity purchases. Household heads with higher education show a preference for shopping in supermarkets or in both (Supermarkets and Butcheries) compared with household heads with medium and low education. However, as the total quantity of beef purchased increases, the probability of purchases only in supermarket is very similar for household heads with different levels of education.

In contrast, the household heads with medium and low education have a high probability of buying beef only in butcheries. The probability further increases with the increase in the quantity of beef purchases. Time opportunity costs of household heads with different levels of education may be the most relevant explaining factor, being higher for more educated people who look to save time with larger purchases in supermarkets.

Households with higher total income are more likely to purchase beef in supermarkets and less likely to do so in butcheries or in both channels. This behavior is similar for male and female household heads, as observed in Figure 3.

On the other hand, and analyzing the differences between the genders of household heads, there is a higher likelihood that female heads make their beef purchases in supermarkets or in both channels (supermarkets and butcheries). Conversely, male household heads seem to prefer butcheries. These differences may be due to the fact that women as heads of households have a greater knowledge of the beef cuts or find it more convenient to buy beef together with other food items in supermarkets.

Beyond the trend in probabilities as shown in Figure 3, households' choice of retail outlets at the same income level is higher for butcheries compared to supermarkets or both channels, both for male or female heads.

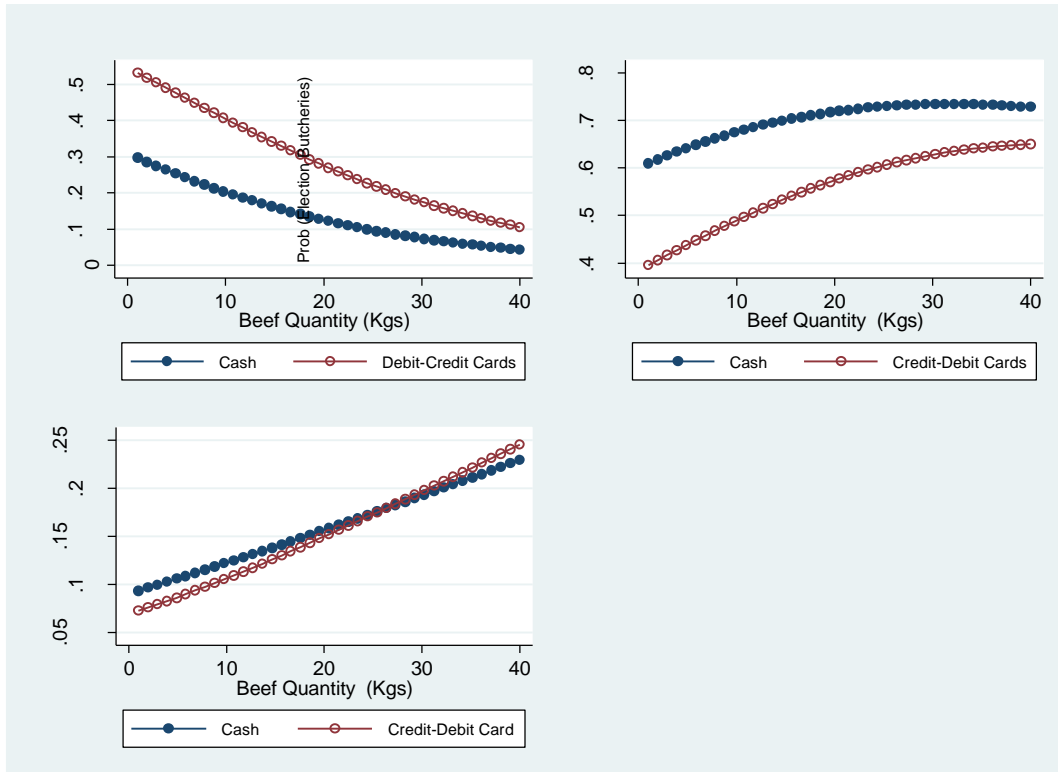


Figure 1. Probability in Selection of Outlet Retailers considering Payment Methods and Beef Quantity Purchased

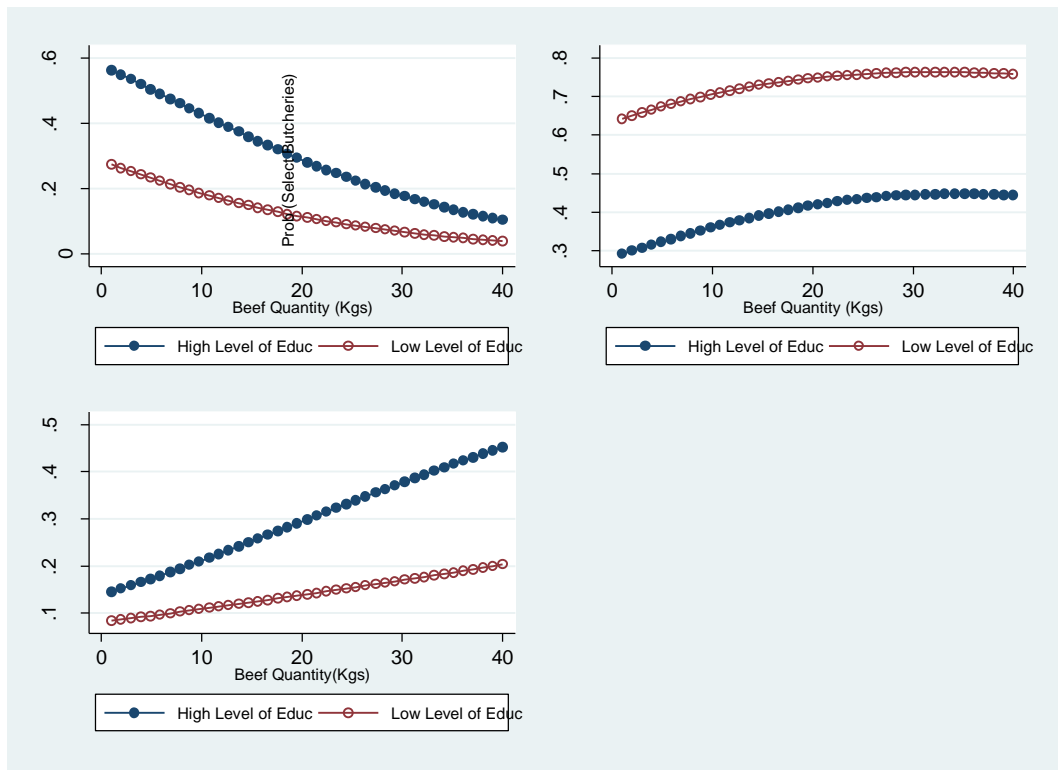


Figure 2. Probability in Selection of Outlet Retailers considering Level of Education of Household Head and Beef Quantity Purchased

The estimated probability of purchases in supermarket increases if total expenditures for beef purchases grow. This same behavior is observed in households that choose to buy beef in both retail channels. Conversely, the estimated probability of purchases in butcherries decline when households increase the

total spending on beef. This would suggest that as beef expenditure increases, households tend to shift their purchases from butcheries to supermarkets.

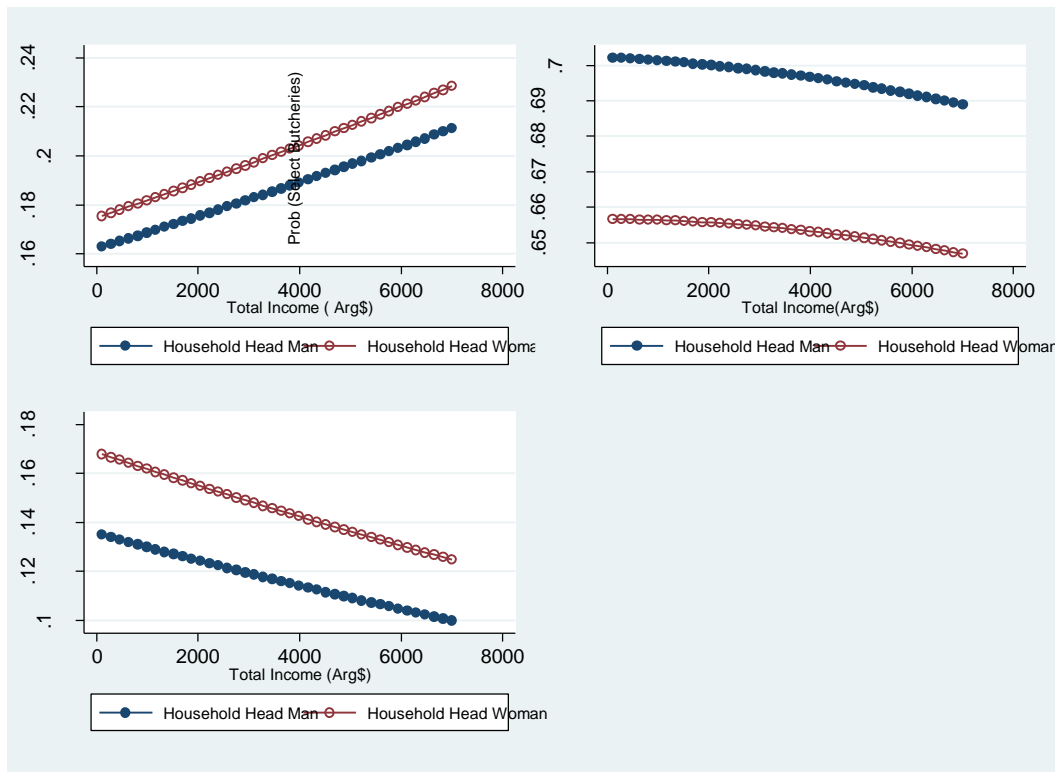


Figure 3. Probability of Outlet Retailers Selection considering Gender of Household Head and Total Income

Nuclear households without children exhibit a larger probability to select supermarkets than other households at different levels of total expenditure, as shown in Figure 4. The difference is larger for the single-person households.

4 Conclusions

Despite its importance in the population diet, Argentine beef consumption has been falling in the last three decades. In the 90's the trend was accompanied with changes in retailer channels, with expectations that the newly arrived supermarket chains would prevail in the beef market, as it did in domestic food trade in general. As it was not the case, many questions arised on the factors which led to that result, including those related to the characteristics of households. To fill the vacuum of studies in the topic, the aim of this paper was to know the impact of household demographic and socio-economic characteristics in the outlet selection for beef. A Multinomial Logit Model was used to evaluate such influences. Empirical results indicated that several household traits have significant effects, such as age of household heads, total beef quantity purchased by households, household type, payment method, and education level of household head.

Butcheries turned out to be the major channel selected by households, having the largest probability of being used as the primary purchase source. However, the likelihood of choosing a supermarket as a main retail channel increases significantly if households own a car, use credit cards to pay for the purchase, buy a small beef quantity and if household heads have a high level of education. In contrast, if the purchase is for large beef quantity, the household does not own a car, purchase is paid by cash and the household head has a low level of education, the probability to purchase beef in butcheries increases considerably.

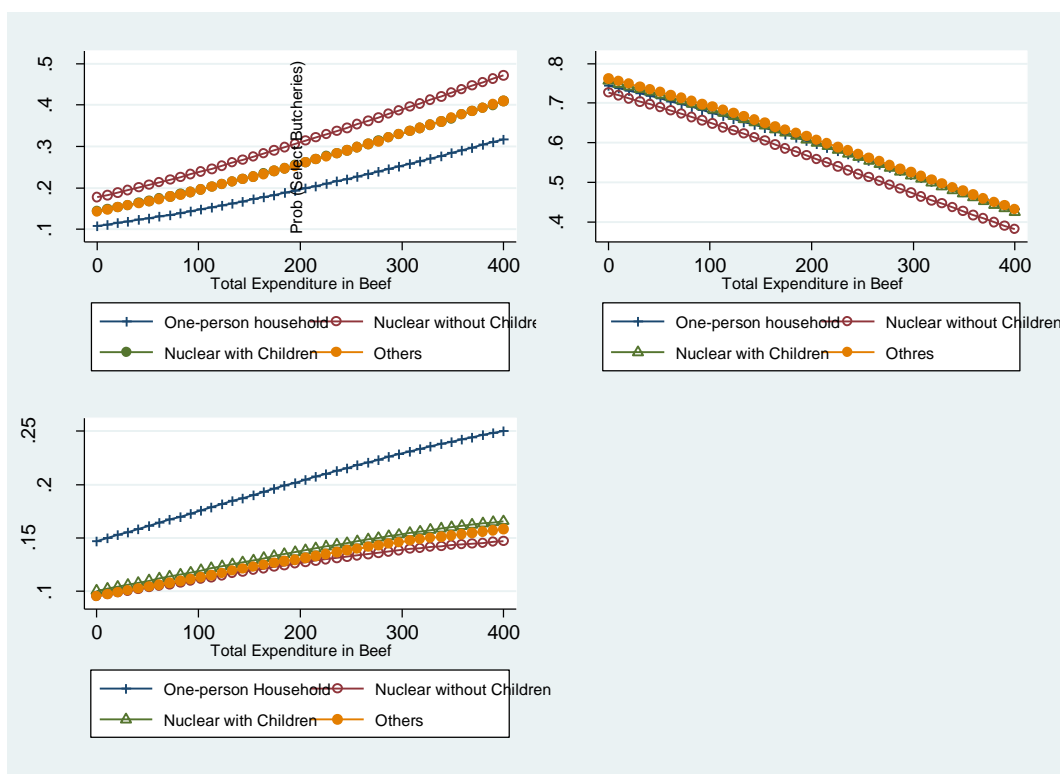


Figure 4. Probability of Outlet Retailers Selection considering Household Type and Total Expenditure in Beef

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APPENDIX**Table 3**

Results of the Multinomial Logit Model

	Supermarket	Butcheries
Age of household head	0.0256*** (0.00791)	0.00905 (0.0066)
No car ownership	-0.0289 (0.212)	0.161 (0.176)
Household head male	0.144 (0.233)	0.285 (0.195)
Beef total quantity	-0.0727*** (0.0242)	-0.0184 (0.0156)
Total expenditure on beef	0.00137 -0.00336	-0.00269 -0.00232
Household income	0.0000812 (0.00007)	0.00004 (0.00006)
Extended home	0.349 (0.442)	0.257 (0.372)
Nuclear	0.589 (0.408)	0.189 (0.359)
Nuclear with children	0.512 -0.397	0.319 -0.335
Cash payment method	-0.836** -0.342	0.179 -0.322
Low education	-0.19 -0.33	-0.688*** -0.267
Medium education	0.142 (0.368)	-1.265*** (0.305)
High education	0.172 -0.398	-1.335*** -0.335
Unemployed	-0.353 (0.268)	-0.237 (0.228)
Household size	-0.0536 (0.0752)	-0.0581 (0.0555)
Constant	0.475 (0.838)	2.006*** (0.712)
Pseudo-R2	0.0767	

Note: error standards in parenthesis***p < 0.01, ** p < 0.05, * p < 0.1