A Double- Hurdle Model of Irish Households' Foodservice Expenditure Patterns

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Abstract: *The aim of this paper is to analyse the various factors fuelling demand for Food-Away-From-Home (FAFH) in Ireland. The two largest components of this industry, the quick-service sector (fast food and takeaway) and the full-service sector (hotel and restaurant meals), are analysed using the most recently available Household Budget Survey data for Ireland. The results from a Box-Cox double hurdle model indicate that different variables affect expenditure in the different sectors in different ways. Income has a greater effect on full-service expenditure than on quick-service. Similarly households that are health-conscious indicate a greater preference for full-service meals while households with higher time values indicate a greater preference for quick-service. Households of a higher social class and those with higher education levels also appear to favour full-service expenditure. In addition, younger, urbanised households favour quick-service meal options. The results emphasise the merits of adopting a disaggregated approach to analysing foodservice expenditure patterns.*

Keywords: Foodservice, Food-Away-From-Home, Quick-service, Full-service, Double Hurdle Model, Box-Cox Transformation.

JEL Classification: D12, D13, C34, R2.

1. Introduction

Over the last decade the Irish economy has experienced significant growth in incomes, household expenditure and labour force participation. As a result, food consumed away from home (FAFH) constitutes an increasingly important part of Irish food expenditure.[1] Between 1987 and 1999/2000 the proportion of total food expenditure allocated to FAFH increased from 14 per cent to 23 per cent as illustrated in Table 1. Previous studies analysing the determinants of FAFH in Europe have tended to focus on the entire market with little

[1] In keeping with most other studies in this area this paper classifies foods 'at home' and 'away from home' based on where the food was prepared or obtained, not where it was consumed [1].

regard given for the diversity of the disaggregated sectors considered in this study, namely quick-service (fast-food and take-away) and full-service (hotel and restaurant meals) [2], [3].[2] Given the diversity of outlets within the foodservice sector a disaggregated approach is important in understanding the dynamics of the FAFH industry. The main objective of this paper is to analyse the factors determining expenditure on both quick-service and full-service meals by Irish households.

INSERT TABLE 1 ABOUT HERE

The quick-service sector is the fastest growing component of the foodservice industry in Ireland. The sector itself is somewhat diverse in that its components include branded quick-service chains, ethnic takeaways and traditional chip shop takeaways [5]. The sector has outperformed the wider eating out market in recent times, in terms of market share, at the expense of full-service options such as hotel and restaurant meals. However, as Table 2 demonstrates, the full-service sector remains the most important component accounting for approximately half of all FAFH expenditure in the most recent dataset.[3] FAFH can be defined as a special type of demand as it incorporates the demand for convenience from eating away from home and the demand for pleasure derived from the social occasion [6]. It is expected in this paper that the demand for convenience is the primary factor driving quick-service expenditure while full-service expenditure is fuelled by the demand for pleasure. However, it has been noted that eating out occasions are becoming increasingly less planned and not restricted to the weekend, rather foodservice meals have increasingly become an everyday occurrence [7].

INSERT TABLE 2 ABOUT HERE

The paper is structured into the following sections. Section 2 describes the data used in this study while Section 3 discusses the econometric methodology. Section 4 compares the results for both quick-service and full-service expenditure. The paper concludes with Section 5.

2. Data

The data used in this study are cross-sectional data taken from the Irish Household Budget Surveys (HBS) of 1994/5 and 1999/2000, collected by the Central Statistics Office of Ireland (CSO)[8], [9].[4] In the HBS each household maintains a detailed diary of household expenditure over a two week period. Data on the socio-economic characteristics of household members are also collected. The survey

[2] One study disaggregated the Greek market into expenditure on restaurant meals, expenditure in coffee houses and expenditure on takeaway meals and canteens [4].
[3] Work canteens, the second largest category, are not analysed as they represent the non-commercial sector. A further reason for not analysing this expenditure category is that prepared sandwiches are included in the category in the most recent dataset.
[4] The 1994/5 HBS and the 1999/2000 HBS are hereafter referred to as 1994 and 1999.

covered a random sample of 7,877 and 7,644 households in both urban and rural areas throughout the state in 1994 and 1999 respectively. After purging observations with incomplete information for household characteristics the reported samples are 7,721 and 7,526 households respectively. The dependent variables in this analysis are household expenditure on quick-service and full-service meals, adjusted for household size using EU adult equivalence scales.[5] Each model is estimated separately. The HBS does not report price or quantity data and as a result households are assumed to face similar relative prices. While restrictive this is a common assumption in studies of this nature and is unavoidable given the data constraints [10], [11], [12]. Quality differences are also uncontrolled for due to data limitations.

The theory of household production underpins much of the literature on FAFH consumption [13]. The household is seen as a consuming and a producing unit and individuals are assumed to maximise their utility subject to their ability to produce goods and services for their personal use, their budget constraint and constraints on their time. In this study, two measures are considered as proxies for household time constraints or the households' opportunity cost of time: firstly the number of workers employed in the labour force[6] and secondly a variable representing whether or not the household is a 'commuter' household.

Recent Irish studies of food expenditure patterns have indicated that health awareness and convenience are two competing factors influencing expenditure decisions in this area [14], [15]. In general, FAFH has been found to have lower nutritional quality than food prepared at home across international studies [16], [17]. In this analysis, the behaviour of households in relation to the purchase of tobacco, a product associated with known health risks, is used to proxy the health awareness of households. Most of the attention regarding health concerns has focused on the quick-service sector and there has been little investigation of health issues in relation to full-service dining. Indeed there is little evidence to suggest that frequent full-service dining is anyway healthier than frequent quick-service dining [19]. Nonetheless, it is expected that health awareness will have a greater impact on quick-service expenditure than full-service.

The HBS does not indicate which household member is primarily responsible for household activities including meal preparation. The expenditure decisions of this individual (the household manager) will best explain the aggregate food expenditure patterns of households. In

[5] EU adult equivalence scales give the first adult a weight of 1, each other adult 0.7, and each child under 14 years a weight of 0.5.

[6] It is assumed that the more household members that are in the labour force the greater the reliance will be on processed foods and other time-saving choices such as FAFH due to increased time constraints. Hours worked by the household manager and a dummy variable for the presence of a working spouse were also considered leading to similar findings.

this analysis the household manager for single households is defined as the survey respondent while for married couples the household manager is defined as the person who works the fewest hours outside of the home. This approach, while straightforward for households of one adult or a married couple, becomes ambiguous for households of multiple unmarried adults [12]. In these cases the household manager is defined as the survey respondent. [7] Where individual characteristics are used to explain expenditure on FAFH they refer to characteristics of the household manager defined in this way rather than the head of household as has been the case in previous studies. This approach adopts the rationale of other recent studies [12], [20]. All variables used in this analysis are described in Table 3 with descriptive statistics presented in Table 4.

INSERT TABLES 3 AND 4 ABOUT HERE

3. Methodology

The main problem with cross-sectional data is that it is complicated by the existence of zero observations on expenditure. Studies of food demand using cross-sectional data are traditionally estimated using limited dependent variable models such as the tobit and double-hurdle models. The presence of zero observations in cross-sectional data can be attributed to distinct factors such as corner solutions and non-participation. The standard tobit model was originally developed to accommodate censoring in the dependent variable. However, this model is considered very restrictive, as it assumes that the determinants of consumption are the same as the determinants of participation. Two-stage estimators such as the double hurdle model are typically used in analyses of this nature to overcome this restriction [21]. Previous research on quick-service expenditure in Ireland found that the double hurdle model outperformed the tobit [18]. This paper continues with this methodological approach. Firstly, in the participation stage, the decision of whether or not to consume FAFH is made. Secondly, the decision is made with respect to the level of consumption or expenditure. A different latent variable is used to model each decision process, with a probit part determining the participation decision and a tobit part determining the expenditure decision. Both decisions are modelled simultaneously.

$$y_{i1}^{*} = w_i'\alpha + v_i \qquad \text{participation decision}$$

$$y_{i2}^{*} = x_i'\beta + u_i \qquad \text{expenditure decision}$$

[7] In the HBS the head of household is the oldest person in the household and given that the completion of the expenditure diary is in itself a task indicative of household management the choice of the head of household as the household manager can easily be justified.

$$y_i = x_i'\beta + u_i \qquad \text{if } y^*_{i1} > 0 \text{ and } y^*_{i2} > 0$$

$$y_i = 0 \qquad \text{otherwise} \tag{1}$$

y^*_{i1}: latent variable describing the household's decision to participate in the quick-service market

y^*_{i2}: latent variable describing household consumption of quick-service.

y_i: observed dependent variable – household expenditure on quick-service.

w_i: vector of variables explaining the participation decision.

x_i: vector of variables explaining the expenditure decision.

v_i, u_i: respective error terms assumed to be independent and distributed as $v_i \sim N(0,1)$ and $u_i \sim N(0,\sigma^2)$.

Models of this nature are heavily reliant on the assumption of normality in the error terms. When this assumption breaks down the maximum likelihood estimates will be inconsistent. A number of approaches have been attempted to transform the dependent and latent variables to accommodate the break down of the normality assumption. One such example is the Box-Cox transformation which takes the following form (equation 2):

$$Y^T = \frac{Y^\lambda - 1}{\lambda} \qquad 0 < \lambda < 1 \tag{2}$$

The log-likelihood function for the Box-Cox double hurdle model can be written as [22]:

$$LogL = \sum_0 \ln\left[1 - \Phi\left(z_i'\alpha\right)\Phi\left(\frac{x_i'\beta + 1/\lambda}{\sigma}\right)\right]$$
$$+ \sum_+ \ln\left[\Phi\left(z_i'\alpha\right) y_i^{\lambda-1} \frac{1}{\sigma}\phi\left(\frac{y_i^T - x_i'\beta}{\sigma}\right)\right] \tag{3}$$

This model is programmed using STATA 8.1[22].[8] Two different sets of explanatory variables are assumed to influence the participation and expenditure decisions with the choice of variables based on a number of *a priori* assumptions. Firstly, it is assumed that once the decision to consume is made, there is little basis to suggest that the opportunity cost of time, proxied by the number of hours worked, would affect the

[8] One drawback of the Box-Cox transformation is that it cannot be applied to negative values. However, negative values are not observed in this dataset.

expenditure level so the number of workers is assumed to only affect the participation decision [10]. Secondly, income is assumed to only affect the expenditure decision. This strategy has been adopted in previous Irish studies of household's food expenditure patterns [14], [15]. The seasonal dummies are assumed to impact on the expenditure decision solely as it is expected that seasonal variations in expenditure but not participation may occur. Significant variables in each step will be retained within the model.

4. Results

The results of the Box-Cox double hurdle model are presented in Tables 5 and 6.[9] The participation results, are described first for both expenditure categories and this is followed by a discussion of the expenditure stage results. The Box-Cox parameter is significantly different from zero in each model supporting its inclusion.

INSERT TABLE 5 ABOUT HERE

4.1 Participation results

Age has a significant and negative effect on the likelihood of participating in both sectors supporting the hypothesis that older household managers are less likely to eat away from home than younger households. There is no evidence that older household managers favour full-service meal options as they age. In general such households would be expected to favour food-at-home. The education variables are not significant in determining participation in the quick-service market. However, being a household manager with a higher level of education significantly increases the likelihood of participation in the full-service sector. Better educated households can be expected to be more aware of the health consequences of consumption of certain food products. These results suggest that the full-service sector is perceived favourably from a health perspective. There is some evidence that social class has a bearing on the likelihood of participation. Both social class variables are significant and positive for full-service in 1994 while the second social class category (social2) has a positive and significant effect on quick-service in that year.

Being a married couple has a negative effect on participation in the quick-service sector in both 1994 and 1999. Such households are assumed to value the importance of the family meal and be more likely to eat food-at-home. Being a single adult household has a negative effect on participation in both markets in 1994, and in quick-service in 1999. As the benefits of preparing one's meals diminish in smaller

[9] A conditional moments test against the null of normal errors was conducted leading to a rejection of the null hypothesis [23].

households, and with growing individualism, a positive effect was expected in the participation stage.[10]

The presence of older children in the household increases the likelihood of participation in the quick-service sector. This variable is significant and positive in both survey years. As children become more independent, and have independent disposable income, they are more likely to consume quick-service food products. This is in line with recent findings that the 15-24 year old age group are the biggest consumers of these products in Ireland within the wider 15-44 age category [5]. The presence of younger children in the household has a negative effect on participation in the full-service market in both survey years, an expected result and likely to reflect cost constraints.

Household size has a significantly positive effect on participation in the quick-service market, though at a decreasing rate, as the squared term has a negative sign. However, household size has a negative effect on participation in the full-service sector overall. With a given level of income, per-capita income will decrease in larger households reducing the likelihood of such households participating in the more expensive market: the full-service sector. An American study also found that larger households spend less on FAFH in all segments, suggesting that such households benefit from economies of scale in food preparation at home [12]. This result is also supportive of this hypothesis.

The urban variable is significant and positive in both 1994 and 1999 indicating that the degree of urbanisation plays an important role in determining the probability of participation in the quick-service market. It is likely that towns will have a higher proportion of quick-service outlets than rural areas due to their larger populations. The urban variable has a positive and significant coefficient on full-service expenditure in 1994 solely suggesting that living in a rural location does not affect households eating out choices in 1999.

As expected the opportunity cost of time variable is positively related to participation in the both sectors. Most studies differ in their quantification of and results reported for the value of household time but it has been seen to exhibit a positive effect [3], [4]. Similarly the coefficient on the commuter variable is positive and significant in both years for both quick-service and full-service. Commuters are more likely to be affected by time constraints than those who do not commute to work. This can be interpreted as a further demand for convenience by commuters.

The proxy variable for health awareness is negative and significant in both the 1994 and 1999 quick-service results. This result highlights

[10] Previous research found a similar result and attributed this to an age effect as pensioners are included in the single adult household dummy variable [19]. However, interaction terms between the age and single variables showed no significance in the quick-service or full-service participation estimates.

how there are two competing forces influencing demand for FAFH in general and quick-service in particular in this study. Households with higher levels of health awareness, are less likely to purchase quick-service compared to households that do not, once time constraints are controlled for. In contrast, this variable has a positive and significant effect on participation in the full-service sector in 1999. This may suggest a higher level of demand for the social occasion of eating out among smokers compared with other groups.

Homeownership has a positive influence on participation in the full-service market in both years but is insignificant for quick-service throughout. This result is likely to be an indication that the social aspect of full-service dining is a significant attraction to homeowners. This is supportive of a recent Spanish study which found that homeowners had a positive influence on participation in the FAFH market [24]. As might be expected, possession of credit cards has a significant and positive influence on both the quick-service and full-service markets.

INSERT TABLE 6 ABOUT HERE

4.2 Expenditure results

Income has a positive effect on quick-service expenditure but at a decreasing rate. The large positive coefficient for income in both the 1994 and 1999 for full-service expenditure is also as expected. This result infers that at higher income levels more money is spent on full-service meals at the expense of quick-service. This is in line with previous results: as households earn more income they purchase more leisure activities, including dining amenities [10], [11].

Age has a negative and statistically significant effect on expenditure in both sectors. Non-linearities are also apparent in the age variable with expenditure declining by an increasing magnitude the older the household manager. Household managers with tertiary education spend significantly less on quick-service products than other households in both survey years. This is also the case for household managers with second level education in 1999. These variables are insignificant in the full-service expenditure model. The social class of the household manager is also an important determinant of expenditure. In both 1994 and 1999, households in the higher social class brackets spend significantly more on full-service compared with other households. There is no significant difference between expenditure levels of households of different social class in the quick-service sector however. Being a female household manager has a significant negative effect on full-service expenditure in 1999 but is not significant elsewhere. It is difficult to interpret this result other than to remark that women are traditionally viewed as the household manager and if they occupy this role then such households are less likely to frequent full-service outlets than other households.

A positive effect is observed for single-adult households on full-service expenditure in both survey years. This result appears to suggest that while these households are less likely to participate than other households when they do, they spend more. As the benefits of home meal preparation diminish in single households this result is largely as expected. Being a married couple has a negative effect on full-service expenditure in both years while it is negative in 1999 for quick-service expenditure. The results indicate that married couples are much less likely than other households to consume FAFH as a whole. Linked to these results is the finding that the presence of younger children has a negative effect on expenditure in the 1999 quick-service study but not in 1994, suggesting perhaps an increased level of awareness of the potentially damaging effect that quick-service consumption can have on young children. The result for the household size variable is as expected and gives credence to the argument that larger households benefit from economies of scale in home meal preparation [12].

Urban households spend more on quick-service than rural counterparts. These results are supportive of those of an American study that found that increasing urbanisation translated into higher household FAFH expenditure [25]. Being an urban household has a negative effect on full-service expenditure suggesting that urban households spend less than rural households. This may be a result of competition between outlets in urban centres making prices lower than in rural areas. A similar result was found in a Greek FAFH total market analysis [3].

Home ownership has a negative effect on quick-service expenditure in 1999. There is also some evidence of seasonality in the results supporting the inclusion of seasonal dummies. As expected, ownership of credit cards also has a significant and positive effect on full-service expenditure in 1994.

5. Conclusion

This paper analyses the factors determining FAFH expenditure by disaggregating the category into its two main components and analysing them separately. The results suggest that different variables influence expenditure in each sector in different ways, thus vindicating the use of such an approach. Health awareness significantly reduces the likelihood of participation and reduces the amount of expenditure on quick-service but no similar effect is observed for full-service. The finding that the demand for convenience is a strong driver of quick-service expenditure also indicates that there is a health-convenience trade-off. Household managers with higher education levels and managers who are of a higher social class favour full-service over quick-service options. There is no apparent evidence that older managers favour full-service over quick-service though it does appear that at higher income levels there is a preference among this group for

full-service dining. Given the current demographic trends in Ireland and, in particular, the growth of a young adult working urbanised population the prospects for FAFH, and particular quick-service, appear buoyant at present. The impact of increased health awareness may impinge on growth in this sector in the future but at the same time this provides encouragement for the full-service sector given their apparent favourable perception from a health perspective. Both sectors must work to develop a favourable healthy image to maintain their growth into the future.

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Table 1: FAFH Expenditure in Ireland.

Years	**1987**	**1994**	**1999**
FAFH as % of total food expenditure	13%	18%	23%

Source: Derived from the HBS of 1994 and 1999 [8], [9].

Table 2: Distribution of FAFH Expenditure in Ireland.

FAFH	**1994**	**1999**
School meals	0.67%	0.2%
Quick-service	17.63%	19.06%
Work Canteens	21.14%	25.99%
Full-service	60.56%	53.16%
Tea/Coffee away from home	-	1.58%

Source: Derived from the HBS of 1994 and 1999 [8], [9].

Table 3: Description of Variables.

Dependent Variable	**Description**
Quick-service	Per capita average weekly expenditure on quick-service (€)
Full-service	Per capita average weekly expenditure on full-service (€)
Independent Variables	
Income	Proxied by per capita average total weekly household expenditure (€)
Income2	Income squared
Age	Age of household manager (1-8)
Age2	Age squared
Hhold	Number of persons in the household
Hhold2	Household size squared
Workers	Number of persons in gainful employment outside the home
Singleage	Single * Age
Discrete Variables	
Social Class	Social1 = 1 for household manager categorised as higher professional, lower professional, employer or manager, 0 otherwise Social2 = 1 for household manager categorised as salaried employee and non-manual workers, 0 otherwise Base category = household manager categorised as manual worker, farmer, other agricultural worker or fishermen
Female	1 = Female household manager

	0 = Male household manager
Single, married	Single=1 for single adult household with or without children, 0 otherwise Married=1 for married couple with or without children, 0 otherwise Base category = households with 2 or more adults with or without children
Education	Secondary = 1 if highest level of education completed was Leaving Certificate education. Tertiary = 1 if highest level of education completed was Third Level education. Base category = highest level of education completed was less than Leaving Certificate.
Homeowner	1 = Household owns their own home 0 = Household does not own their own home
Urban	1 = Urban household 0 = Rural household
Oldkids	1 = Children aged 14- 18 present 0 = No children aged 14- 18 present
Youngkids	1 = Children aged less than 14 present 0 = No children aged less than 14 present.
Commuter	1 = A Household member is employed outside the home and incurs higher than the mean level of travelling expenses 0 = Household members are not in employment or do not incur higher than the mean level of travelling expenses
Nosmoke	1 = Household spends nothing on tobacco during the survey period 0 = Household spends a positive amount on tobacco during the survey period
Visa	1 = Household possesses at least one credit card 0 = Household possesses no credit cards
Seasonal dummies	Spring = 1 if consumption occurred in Spring, 0 otherwise Summer = 1 if consumption occurred in Summer, 0 otherwise Autumn = 1 if consumption occurred in Autumn, 0 otherwise Base category = consumption occurred in Winter

Table 4: Summary Statistics

	Mean (€)		***Standard Deviation***		***Maximum(€)***		***% Zeros***	
Dependent	*1994*	*1999*	*1994*	*1999*	*1994*	*1999*	*1994*	*1999*
Quick- service	1.072	1.947	2.126	3.433	35.56	84.65	56%	50%
Full- service	4.47	6.51	9.41	12.3	165.	166.	48%	47%

	3	3	7	91	89	02
Independent - Continuous						
Income (ln)	4.923	5.274	0.601	0.679	7.041	8.401
Income^2 (ln)	24.598	28.271	5.965	7.119	49.577	70.569
Age	5.083	5.274	1.654	1.657	8	8
Age^2	28.572	29.094	17.665	17.272	64	64
Hhold	3.182	2.904	1.877	1.535	15	12
Hhold2	13.647	10.789	15.405	10.676	225	144
Workers	1.130	1.246	0.943	0.988	7	7
Singleage	1.582	1.404	2.755	2.643	8	8
Independent – Discrete						
Social1	0.218	0.242				
Social2	0.221	0.276				
Female	0.500	0.529				
Single	0.241	0.273				
Married	0.471	0.446				
Secondary	0.464	0.493				
Tertiary	0.120	0.191				
Homeowner	0.807	0.842				
Urban	0.543	0.637				
Oldkids	0.211	0.186				
Youngkids	0.403	0.381				
Commuter	0.223	0.362				
Nosmoke	0.519	0.560				
Visa	0.265	0.419				
Spring	0.23	0.20				

	4	1
Summer	0.26	0.29
	3	5
Autumn	0.43	0.30
	6	3

Table 5: Box-Cox Double Hurdle Participation Results 1994 and 1999.

Variables	***1994 Quick***	***1994 Full***	***1999Quick***	***1999 Full***
Constant	-0.2296***	0.2099	0.0361	-0.0460
	(0.1475)	(0.3939)	(0.1672)	(0.4008)
Age	-0.1808***	-0.0917***	-0.2351***	-0.0804***
	(0.0130)	(0.0239)	(0.0147)	(0.0267)
Workers	0.2848***	0.1669***	0.2131***	0.1363***
	(0.0244)	(0.0511)	(0.0258)	(0.0519)
Hhold	0.2496***	-0.2966	0.3707***	-0.0031
	(0.0384)	(0.2244)	(0.0587)	(0.1993)
Hhold2	-0.0207***	0.1176***	-0.02804***	0.0554*
	(0.0039)	(0.0404)	(0.0058)	(0.0306)
Secondary	-	0.2839***	-	0.2048***
		(0.0639)		(0.0679)
Tertiary	-	0.6258***	-	0.3106***
		(0.1109)		(0.0874)
Female	-	-	-0.0179	-
			(0.0351)	
Social1	-	0.1974**	-	-
		(0.0880)		
Social2	0.1019***	0.1467*	0.0656*	-
	(0.0389)	(0.0781)	(0.0373)	
Single	-0.3022***	-0.2974**	-0.3737***	-0.1919
	(0.0685)	(0.1386)	(0.0819)	(0.1772)
Married	-0.4611***	-	-0.4021***	-0.1136
	(0.0437)		(0.0492)	(0.1016)
Youngkids	-	-0.3149***	-0.1031	-0.3411***
		(0.1180)	(0.0649)	(0.1307)
Oldkids	0.6084***	-	0.5340***	-
	(0.0464)		(0.0519)	
Urban	0.3597***	0.2552***	0.4547***	-
	(0.0351)	(0.0615)	(0.0352)	
Nosmoke	-0.1310***	-	-0.0781**	0.2161***
	(0.0333)		(0.0345)	(0.0572)
Homeowner	-	0.1502**	-	0.2061***
		(0.0711)		(0.0775)
Commuter	0.1281***	0.2076**	0.1332***	0.4141***
	(0.0408)	(0.0879)	(0.0386)	(0.0741)
Visa	0.1270***	0.3925***	0.0961***	0.3004***
	(0.0333)	(0.0742)	(0.0363)	(0.0631)

Table 6: Box-Cox Double Hurdle Expenditure Results 1994 and 1999.

Variables	*1994 Quick*	*1994 Full*	*1999 Quick*	*1999 Full*

Constant	-4.5353***	-19.4905***	-5.5878***	-39.064***
	(1.1894)	(1.0629)	(1.1283)	(4.9495)
Income	2.0645***	4.5807***	2.1883***	10.0989***
	(0.4645)	(0.1558)	(0.4131)	(1.7847)
Income2	-0.1480***	-	-0.1529***	-0.3410**
	(0.0455)		(0.0377)	(0.1642)
Age	-0.1808***	-0.5210**	-0.1318***	-1.0182***
	(0.0130)	(0.2478)	(0.0169)	(0.3804)
Age2	0.0538***	0.0617**	-	0.1282***
	(0.0084)	(0.0248)		(0.0376)
Hhold	-0.1937***	-0.8566***	-	-0.9156***
	(0.0397)	(0.1351)		(0.2507)
Hhold2	0.0147***	0.0725***	-	0.0904***
	(0.0038)	(0.0131)		(0.0255)
Singleage	-	-	0.0589***	-
			(0.0125)	
Secondary	-	-	-0.1221**	
			(0.0477)	
Tertiary	-0.1262**	-	-0.2276***	-
	(0.0533)		(0.0592)	
Female	-	-	-	-0.8437***
				(0.1683)
Social1	-	0.4556***	-	0.7488***
		(0.1566)		(0.2198)
Social2	0.1019***	0.4311***	0.0656***	0.4335**
	(0.0389)	(0.1469)	(0.0373)	(0.2035)
Single	0.2488***	0.6629***	-	1.2286***
	(0.0678)	(0.2539)		(0.4027)
Married	-	-0.5663***	-0.0675*	-0.3955*
		(0.1342)	(0.0401)	(0.2173)
Youngkids	-	-	-0.0866***	-
			(0.0403)	
Oldkids	-	-	-	-0.2733
				(0.2227)
Urban	0.2793***	-0.2375*	0.3166***	-
	(0.0387)	(0.1245)	(0.0359)	
Nosmoke	-0.1188***	0.2241*	-0.1051***	-
	(0.0348)	(0.1109)	(0.0347)	
Homeowner	-	-	-0.0894*	-
			(0.0508)	
Commuter	-	0.4356***	-	-
		(0.1265)		
Visa	-	0.3307**	-	-
		(0.1328)		
Summer	-	-	-	0.4770**
				(0.1937)
Autumn	0.0844**	0.3702***	-	0.7645***
	(0..343)	(0.1063)		(0.1924)
σ	0.9790***	3.4604***	1.0203***	5.1487***
	(0.0134)	(0.0856)	(0.0176)	(0.1783)

λ	0.1229***	0.5409***	0.1376***	0.6244***
	(0.1475)	(0.0084)	(0.0137)	(0.0104)
Loglikelihood	- 10064.61	16240.958	12236.5	17653.942