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Abstract

The study employed Tobit models corrected for heteroscedasticity and applied to Canadian household survey data to analyze household consumption of food away from home (FAFH) by type of establishment and type of meal. Results suggest that failing to correct for heteroscedasticity causes most model parameters to be overestimated. Other results indicated that the influence of socioeconomic and demographic variables on FAFH expenditures were conditional on both the type of meal and type of establishment.

Keywords: Food away from home, Heteroscedasticity, Tobit model.

Food Consumption Away From Home by Type of Facility and Type of Meal

During the past three decades, in contrast to food at home (FAH) consumption, food away from home (FAFH) has become an increasingly important component of food expenditures and disposable income. Expenditures on FAFH as a percentage of total food expenditures increased from 17 percent in 1961 to 30 percent in 1989. During the same period, the share of FAFH expenditures of disposable income rose by 0.5 percent while the share of FAH expenditures fell by 8.4 percent (Agriculture Canada). The increased prominence of FAFH has been attributed to changes in household composition and increasing demand for convenience induced by rising income and changes in labor market participation.

Recognizing that this development in the pattern of food consumption may have important implications for the food industry, researchers have modelled demand for FAFH in aggregate (Haidacher et al., Lee and Phillips, Raunikar, Salathe, Smallwood and Blaylock) and by type of facility (McCracken and Brandt). Demand for FAFH by type of meal (breakfast, lunch, and dinner), however, have not been analyzed. Nonetheless, since some food items are consumed primarily during certain meals, modelling demand for FAFH by type of meal could provide useful additional information. For example, breakfast cereal, eggs and milk are consumed primarily during breakfast, thus analyzing demand for breakfast away from home would facilitate linking FAFH with these particular food items. Moreover, given that meal types may differ temporally and in content, it is likely that the influence of household socioeconomic and demographic factors on FAFH would be conditional on meal type.

The present study models Canadian demand for FAFH by type of facility and type of meal. The analysis is conducted with Tobit models corrected for heteroscedasticity and applied to household survey data. Previous studies have not employed micro data to model Canadian demand for FAFH.

Model Specification

Since the decision to eat out is closely related to household meal production and the allocation of household time, household production theory provides a convenient framework for analyzing FAFH consumption. Household production theory, developed from the work of Gorman (1980), Becker (1965), and Lancaster (1966), suggests that consumers ultimately derive satisfaction from the consumption of household commodities which the household produces from combining market goods and household time. Following this notion, assume that the household consumes four household commodities, which include Q_h (FAH), Q_r (FAFH), L_e (Leisure), and Q_o (a composite good representing all other goods). Assume further that $Q_h = Q_h (Z_h, L_h, a)$ and that the commodities Q_r, Q_o are identical to the corresponding market goods (meaning little or no production is involved), thus the household allocates total household time, L_t, into work, L_w, production of Q_h, L_h, and leisure, L_e. The household is assumed to maximize the one period utility function

(1) $U(Q_h, Q_r, Q_o, L_e; a)$

subject to

(2) $P_hZ_h + P_rQ_r + P_oQ_o = WL_w + V$

(3) $Q_h = Q_h(Z_h, L_h, a)$

(4) $Q_r = Z_r$

(5) $Q_o = Z_o$

(6) $L_t = L_h + L_w + L_e$

where $P_j(j=h,r,o)$ is the price of the jth market good, Z_j, W is the wage rate faced by the household, V is non-wage income, and 'a' is a vector of household characteristics (including factors such as age and education that are indicative of household human capital) that can be expected to influence the household's taste and preferences over the commodity choice set, and the technology with which the household transforms market goods into FAH commodities. Equation (2) and (6), respectively, embodies the household budget and time constraint. Equation (3) defines the technology by which

the household transforms market goods into FAH commodities. According to equation (3), the household combines market goods along with household time and human capital to produce FAH commodities. As presented, the model treats Z_h, Q_h, Q_r, Q_o, L_e, L_h and L_w as endogenous, while a, L_t, P_j, W, and V are predetermined.

Assuming that the choice variables[1] are Z_h, Q_r, Q_o, L_h and L_w,

the Langrangean function corresponding to the above maximization problem can be presented as:

(7) $L = U(Q_h(Z_h,L_h,a),Q_r,Q_o,L_e,\lambda_1,\lambda_2;a)$

$-\lambda_1(P_hZ_h + P_rQ_r + P_oQ_o - WL_w - V) - \lambda_2(L_h + L_w + L_e - L_t)$.

The first order conditions for maximization follow as:

(8) $(\partial U/\partial Q_h)(\partial Q_h/\partial Z_h) = \lambda_1 P_h$

(9) $(\partial U/\partial Q_r) = \lambda_1 P_r$

(10) $(\partial U/\partial Q_o) = \lambda_1 P_o$

(11) $(\partial U/\partial Q_h)(\partial Q_h/\partial L_h) = \lambda_2$

(12) $\lambda_1 W = \lambda_2$

(13) $WL_w + V = P_hZ_h + P_rQ_r + P_oQ_o$

(14) $L_t = L_h + L_w + L_e$

where λ_1 is the marginal utility of income and λ_2 is the marginal utility of time.

The marginal rate of substitution between FAH and FAFH

commodities, which can be expressed as

(15) $\left[\lambda_1 P_h(\partial Q_h/\partial Z_h)^{-1}\right](\partial U/\partial Q_r)^{-1}$,

suggests that the more efficient the household is at transforming the market good Z_h into FAH, the less willing the house will be to substitute FAH for FAFH. In a similar fashion, we can show that efficiency with regard to household time in the production of the FAH commodity produces a similar effect. Consequently, we can expect household characteristics that influence household production

efficiency to be important determinants of FAFH. Equation (8) indicates that the marginal utility of income is positively related to the marginal product of Z_h in the production of Q_h, while equation (11) suggests that the marginal utility of time is positively related to the marginal product of L_h. Equation (12), on the other hand, indicates that the marginal utility of time is in direct proportion to the wage rate, hence the wage rate provides an indication of household valuation of time.

From these first order conditions we obtain demand for FAFH as

(16) $Q_r = f(P_h,P_r,P_o,W,V,a)$.

However, recognizing that the data for the study span a short time period (one week), and price differences across households can be captured by temporal and spatial location variables, equation (1) reduces to: $Q_r = f(W,V,a)$. In the empirical specification, expenditures on FAFH by type of facility and type of meal were employed as the dependent variable. Regarding the independent variables, household wages and salaries earned in the previous year are used to represent W, and V is represented by household income. The vector of household characteristics, a, included household size, household composition, the household's social assistance status, the age, sex, education, marital status and occupation of the household head, the urban, provincial and seasonal location of the household, and the number of earners in the household. Age, education, sex, household size and household composition can be expected to influence FAFH consumption through both the household production technology and the household's taste and preferences. Marital status and occupation may capture preference differences across lifestyles, and, in addition to capturing price differences, urban and provincial variables can be expected to reflect preference differences across localities. Similarly, seasonal variables can be expected to capture preference differences across time. The number of earners in the household (and also the wage variable) is expected to capture the household's labor market participation phenomenon and thus would give an indication of how binding the time constraint (equation 6) is. Marital status (single versus two headed households) and household composition (for example, households with young children) can also provide similar indications.

Households may substitute FAFH for FAH for several different reasons including entertainment or leisure, time and location (for example, meals while away from home) convenience, and food variety. The particular time or food establishment at which the household choose to eat would thus depend on the predominant motivation for eating out. Therefore, since the particular reason for eating out depends on the nature of the household in question, we can expect the effect of the included explanatory variables to differ across FAFH facilities and meal types. Accordingly, demand for FAFH was specified by type of facility and type of meal.

Tobit Model Corrected for Heteroscedasticity

A large proportion of households surveyed reported zero expenditures on FAFH. For example, 22 percent of households did not eat out during the one week survey period, while 44, 45, and 62 percent of households did not eat at table service, fast food, and cafeteria establishments, respectively. Similarly, 41, 42, 29, and 75 percent of households, respectively, did not eat lunch, dinner, between meals, and breakfast away from home. These large portions of the dependent variables taking zero values suggest a censored regression model such as the Tobit model as an appropriate framework for the estimation of the Engel curves.

The Tobit model as developed by Tobin (1958) is represented as follows:

$$(17) \quad Q_{ij}^{*} = x_{ij}\beta_j + e_{ij} \quad e_{ij} \sim IN(0, \sigma_j^2)$$

$$(18) \quad Q_{ij} = Q_{ij}^{*} \quad \text{if } Q_{ij}^{*} > 0$$

$$= 0 \quad \text{otherwise}$$

where Q_{ij} is the ith household's observed expenditures on the jth (j=table service, fastfood, and cafeteria; alternatively, j=breakfast, lunch, dinner, and between meals) FAFH category, Q_{ij}^{*}, is a corresponding latent variable that represents the desired or optimal level of household consumption and can be construed as the solution to the utility maximization problem expressed in equation (1)-(6), $x_{ij} = (W,V,a)$, is the vector of socioeconomic and demographic variables, defined in the previous

section, which characterizes the household's taste and preferences, the budget and time constraints the household faces, and the household's stock of human capital. The error term e_{ij} is assumed to be independently normally distributed with zero means and homoscedastic. According to this specification, observed expenditures are equal to desired expenditures if desired expenditures are positive, otherwise zero expenditures are observed. Hence the sample is censored at zero.

Dropping the jth subscript for convenience, the log likelihood for equations (1) and (2) has the form

$$(19)\ \sum_{0} \log(1-\Phi_i)-(1/2)\sum_{1} \log\sigma^2-(1/2)\sum_{1} (Q_i-x_i\beta)^2/\sigma^2$$

where Φ_i represents the standard normal distribution function evaluated at $x_i\beta/\sigma$, and the summation indexes refer to observations below and above the limit.

The Tobit model of equation (17) and (18) assumes that the variance of the error term is constant across households. However, the assumption of homoscedasticity is very often unreasonable given cross-sectional data. For example, we can expect the spending pattern of high income households to exhibit greater variability than their low income counterpart. Heteroscedasticity is particularly critical in the Tobit model, because unlike the standard regression model, violation of the homoscedasticity assumption may render parameter estimates inconsistent (Hurd, Goldberger). Therefore rather than assume homoscedasticity, following Reynolds and Shonkwiler, heteroscedasticity is explicitly introduced into the model, by assuming that the variance is related to a set of exogenous variables, Z.

Accordingly, the log likelihood function has the form

$$(20)\ \sum_{0} \log(1-\Phi_i)-(1/2)\sum_{1} \log\sigma_i^2-(1/2)\sum_{1} (Q_i-x_i\beta)^2/\sigma_i^2$$

where Φ_i is now evaluated at $x_i\beta/\sigma_i$, and $\sigma_i^2 = f(Z_i,\alpha)$ with α being a vector of parameters whose values will be determined upon maximization. Upon obtaining model estimates, a likelihood ratio test can be constructed to test the homoscedasticity assumption.

Data and Estimation

The study utilized household survey data generated from the 1986 Family Food Expenditure Survey, sponsored by Statistics Canada. After deleting households with missing relevant information, such as households with incomplete income reporting, 10608 households or observations were available for conducting the study.

Table 1 gives a description of the variables included in the analysis. The expenditures on FAFH are household reported expenditures during the survey week. On the average, households spent $46.00 a week on FAFH. Out of that amount 56 percent was spent at table service restaurants, 25 percent at fast food establishments, 11 percent at cafeterias and 7 percent at other food establishments. Regarding expenditures by meal type, 49 percent was spent on dinners, 15 percent on lunches, and 12 and 7 percent on between meals and breakfast, respectively.

Version 4.2 of the Time Series Processor (TSP), using the Newton algorithm, was employed to obtain maximum likelihood estimates of the parameters.

Some experimentation suggested that the variance was not constant over the households in the sample. Several of the explanatory variables were thus considered as candidates for parameterizing the variance. The variance was modelled as

(21) $\sigma_i^2 = \alpha_0 + \Sigma\alpha_k Z_k$

where k=(income, household size, age, number of earners, wages, and proportion of household members less than five years old). However, only the variables whose associated variance coefficients where significantly different from zero were included in the final specification. Results for the standard Tobit model (equation 19) and the heteroscedastic Tobit model (equation 20) are presented in Tables 2 and 3. None of the variables considered in parameterizing the variance of the cafeteria and between meal equations were significant, hence only the standard Tobit results are reported for these two equations. For the remaining equations, based on likelihood ratio test results, the homoscedasticity assumption was soundly rejected at conventional probability levels. Thus correcting

for heteroscedasticity improved considerably the fit of the model. Moreover, a comparison of the results of the standard Tobit model and the heteroscedastic Tobit model reveals that in general the effect of the explanatory variables are overestimated when heteroscedasticity is ignored. Further discussion of the results are thus based on the Tobit specification corrected for heteroscedasticity.

Results

This section presents Tobit estimates of total FAFH expenditures, expenditures by type of facility, and by type of meal.

Total Expenditures on FAFH. Tobit results on total expenditures on FAFH are given in the third column of Table 2. According to the reported T-statistics, about 70 percent of the estimated coefficients are significant at the 95 percent level. As expected, the coefficient on the income variable is positive and significant. In addition to FAFH being a normal good, this result may also be reflecting the empirical finding (Shonkwiler et al) that income is positively related to food variety in consumption. Eating out represents one way in which the household may vary its diet. Moreover, in some instances, FAFH is consumed jointly with leisure which is also considered a normal good. McCracken et al. found similar results pertaining to income. In contrast to income, households which received social assistance spend less on FAFH than non-recipients. This phenomenon may be linked with the positive relationship existing between income and FAFH.

Household size is shown to have an increasingly negative impact on FAFH expenditures. This result may be indicative of the presence of economies of scale in the production of home meals relative to meals away from home. Arguably, there is very little or no economies of scale involved in FAFH consumption. Household composition also appears to be an important determinant of FAFH. The presence of young children in the household is shown to have a significant negative impact on eating out. This result conforms with prior expectations. The presence of young children can be expected to increase both the cost (cost of baby sitting) and inconvenience of dining out.

Results suggest that both the age and sex of the household head has a significant impact on FAFH. Expenditures on FAFH is negatively related with the age of the household head, and, compared with male headed households, female headed households tend to spend less on FAFH. Changes in lifestyle and increasing productivity in meal preparation associated with aging may partly explain the result pertaining to age, while tradition and greater human capital in food preparation on the part of women may explain the sex result.

The level of education of the household head has a significant positive impact on FAFH expenditures. A priori, the effect of education on FAFH consumption was perceived as ambiguous, because while education was thought to enhance household productivity in meal preparation, lifestyle, as reflected by eating habits, can be expected to be conditional on level of education. According to the results, the lifestyle effect appears to dominate the productivity effect.

Provincial location is shown to be an important factor affecting FAFH expenditures. The Atlantic provinces spend the least on FAFH, while Alberta spends the most. Temporal location also appears to influence FAFH expenditures. Households spend significantly more on FAFH during the second and third quarter than during the rest of the year. Unfavourable weather conditions during the first and fourth quarter and the incident of events such as thanksgiving and christmas during the fourth quarter may partly explain this result.

In addition to capturing the phenomenon of both spouses participating in the labor force, the number of earners gives an indication of the degree of decentralization of household food consumption decisions. The occupation of the household head can also be expected to partly characterize the nature of household labor market participation. Additionally, the lifestyle of an individual may be conditional on occupation. Both variables appear to be important determinants of FAFH consumption. The number of household earners is shown to have a significant positive impact on FAFH expenditures, while professional and sale occupations, compare with other occupations, predisposes the household towards greater FAFH expenditures.

FAFH Expenditures by Type of Facility. For any given meal, household choice of food facility will depend on relative cost, accessibility or availability of the different facilities, perceived differences in food quality or nutritional content of food offered at different establishments, and motivation for eating out--whether it is because of time constraint, leisure, entertainment, or a change of diet.

Results pertaining to FAFH expenditures by type of facility are presented in the remaining columns of Table 2. Household income, education, number of earners and occupation is shown to have a significant and positive impact on all three types of facilities. However, the magnitude of these effects differ across food facilities. For example, income and number of earners have their greatest impact on table service establishments followed by fast food facilities, while education and occupation have their greatest impact on table service facilities and their least impact on fast food establishments.

The age of the household head, the social assistance variable and the proportion of the household of less than five years (household composition) are also significant across type of facilities, but they have the opposite effect (negative) on FAFH expenditures. The influence of age is most pronounced on fast food established, while that of household composition and the social assistance variable are most pronounced on table service facilities.

In terms of direction and statistical significance, the effects of the remaining variables were not as uniform across type of facility. Household size is shown to have no significant effect on cafeteria services, but a negative effect on expenditures at table service establishments and a positive impact on expenditures at fast food facilities. This result suggests that because it is more costly for a large household to eat out than a smaller household, when the large household decides to eat out it is more likely than the smaller household to choose the least cost option, which in most cases would be the fast food establishment.

The marital status variable is seen to have no significant impact on expenditures at table service and cafeteria establishments, but a significant negative effect on fast food expenditures. The sex variable (female as opposed to male headed households) is shown to have significant negative

effects on table service and fast food expenditures but no significant impact on expenditures at cafeterias.

The effects of the location variables also appear to differ across food establishments. For example, while urbanization had an insignificant impact on expenditures at table service restaurants, urban dwellers were shown to have a significant positive impact on expenditures at fast food and cafeteria facilities. Availability of fast food and cafeteria establishments and distance of work place from home may partly explain this result. Fast food and cafeteria facilities are more readily available in urban areas, and urban dwellers usually work greater distances away from home, thus making it inconvenient to have certain meals at home.

Regarding provincial location, households located in Ontario tend to spend the most at fast food establishments, while those in Quebec spend the least amount. In contrast, households in Manitoba-Saskatchewan followed by those in Quebec spend the most at cafeterias. Similarly, those in British Columbia followed by Alberta spend the most at table service facilities.

Seasonality does not appear to be an important determinant of expenditures at table service restaurant. However, seasonality is shown to be an important factor in explaining fast food and cafeteria expenditures. For example, households surveyed in the second and third quarter spend significantly more at fast food establishments than those surveyed during the fourth quarter. In contrast, households spend the most at cafeteria establishments during the first quarter and the least amount during the third quarter.

Household wages had a significant (positive) impact on expenditures at only cafeteria establishments. This may suggest that the time-saving factor feature more importantly in households choosing cafeteria than in their decision regarding table service or fast food establishments. This result contrast with the findings of McCracken et al. that wages (value of time) have a significant positive effect on expenditures at restaurant, fastfood and other commercial facilities.

FAFH Expenditures by Type of Meal. Since meal types (breakfast, lunch, and dinner) are served at

different times of the day, and may differ in content, we can generally expect the effect of the explanatory variables on FAFH to depend on the meal in question. Time of day may influence FAFH consumption because household members are more likely to be away from home or are more time constrained during certain parts of the day.

The results indicate that the influence of most of the explanatory variables are not homogeneous across meal type. Although education, number of earners and the occupation variable all have a positive effect across meal types, in terms of magnitude, these variables have their greatest impact on dinner expenditures. On the other hand, the age, sex, social assistance and household composition variables will predisposed the household to spend less on all meal types. But like in the previous case, these variables also have their greatest impact on dinner expenditures.

Income has a positive significant effect on lunch and dinner meals but appears to be a less important factor in breakfast and between meal consumption. Household size has a negative significant impact on breakfast, lunch and dinner, but a positive effect on between meals. Marital status appears to be an important determinant of only lunch and dinner meals. Being married predisposes the household to spend less on both of these meal types.

Urbanization appears to be an important determinant of only breakfast and between meals. Results indicate that urban households tend to spend more on breakfast and between meals than other households. Provincial location also have differing impacts on meal types. Households in Alberta spend the most on breakfast meals, those in Quebec spend the most on lunches, while those in British Columbia and Manitoba-Saskatchewan spend the most on Dinner and Between meals, respectively. In contrast, households in Quebec spend the least amount on between meals, while those in the Atlantic provinces spend the least on breakfast, lunch and dinner.

Seasonality appears to be an important determinant of only Dinner and between meals. Households spend the most on Dinners during the third quarter, while expenditures on between meals are most pronounced during the first three quarters of the year.

The wage variable is shown to have a significant (positive) effect on only breakfast and between meal expenditures, suggesting that the time constraint factor is an important consideration in the household choosing to eat breakfast and between meals away from home.

Income and Household Size Elasticities

Income and household size FAFH expenditure elasticities computed at data means are presented in Table 4. As expected, all the income elasticities are positive, implying that FAFH consumption is a normal good across type of establishment and across meal type. With the exception of between meals, these income elasticities are all significant at the 95 percent level. Regarding expenditures by type of facility, table service (0.75), followed by fast food (0.39) exhibits the largest income elasticity, while among expenditures by meal type, dinner (0.70), followed by lunch (0.67) is most income elastic.

The household size FAFH expenditure elasticity is significant in all but the cafeteria equation. Expenditures at table service establishments, and on breakfast, lunch and dinners exhibit negative household size elasticities, while expenditures at fast food establishments and on between meals have positive household size elasticities.

Summary

In addition to analyzing Canadian FAFH consumption by type of facility, this study disaggregates the analysis of FAFH consumption in yet another direction--type of meal. Moreover, previous studies that have employed the Tobit model to analyze FAFH consumption have failed to correct for heteroscedasticity. The results of this study suggest that failing to correct for heteroscedasticity would in general bias the parameter estimates upwards. Other results point out that there is value to modelling demand for FAFH, both by type of facility and type of meal. For example, while household size was shown to have a significant negative impact on expenditures at table service

and cafeteria establishments, it had a significant positive impact on expenditures at fast food establishments, suggesting that because it cost larger households relatively more to eat out than smaller households, when larger household do decide to eat out they are more likely to choose the least cost establishment. An example regarding expenditures by type of meal was that household wages, included to measure household valuation of time, did not appear to influence expenditures on lunch and dinners, but had a significant positive impact on expenditures on breakfast, and between meals. This may suggest that households are most time constrained during morning hours.

Notes

1. Once L_h and L_w are chosen then L_e is determined. Similarly, once Z_h and L_h are chosen then Q_h is determined.

References

Becker, G.S. "A Theory of the Allocation of Time." Economics Journal, 75(1965):493-517.

Goldberger, A.S. "Abnormal Selection Bias". In: Studies in Econometrics, Time Series and Multivariate Statistics. Karlin, S. et al. (eds), New York: Academic Press, 1983.

Gorman, W.M. "A Possible Procedure for Analyzing Quality Differentials in the Egg Market." Rev. of Econ. Studies 47(1980):843-56.

Haidacher, R.D., J.A. Craven, K.S. Huang, D.M. Smallwood, and J.R. Blaylock. "Consumer Demand for Red Meats, Poultry, and Fish." Washington DC: U.S. Department of Agriculture, Econ. Res. Serv. NED AGES 820818, 1982.

Hurd, M. "Estimation in Truncated Samples when There Is Heteroscedasticity." J. of Econometrics, 11(1979):247-58.

Lancaster, K.J. "A New Approach to Consumer Theory." J. of Political Economy, 74(1966):132-57.

Lee, Feng-Yao and K.E. Phillips. "Differences in Consumption Patterns of Farm and NonFarm Households in the United States." Amer. J. Agr. Econ., 53(1971):573-82.

McCracken, V.A. and J.A. Brandt. "Household Consumption of Food-Away-From-Home: Total Expenditure and By Type of Food Facility." Amer. J. Agr. Econ., 69(1987):274-84.

Salathe, L.E. "Household Expenditure Patterns in the United States." Washington DC: U.S. Department of Agriculture, ESCS Tech. Bull. No. 1603, 1979.

Smallwood, D.M. and J.R. Blaylock. "Impact of Income and Household Size on Food Spending Patterns." Washington D.C. U.S. Department of Agriculture, ESCS Tech. Bull.No. 1650, 1981.

Raunikar, R. "Summary of Food Purchases and Prices." Griffin, Georgia, April-June 1976 with Previous Periods. Georgia State Exp. Sta. Res. Rep. No. 258, Oct. 1977.

Reynolds, A. and J.S. Shonkwiler. "Testing and Correcting for Distributional Misspecifications in the Tobit Model: An Application of the Information Matrix Test." Empirical Economics 16(1991):313-23.

Shonkwiler, J.S., J. Lee, and T.G. Taylor. "An Empirical Model of the Demand for Varied Diet." Applied Economics, 19(1987):1403-10.

Statistics Canada, "1986 Consumer Expenditure Survey." Household Surveys Division, Family Expenditures Surveys Section, Ottawa, Canada, 1988.

Table 1. Variable Definition.

Variables	Mean	Std.Dev.	Definition
Dependent Variables			
total FAFH	46.0062	66.2080	Total expenditures on food away from home.
table service	25.9739	53.0365	Expenditures at table service establishments.
fastfood	11.6279	19.8907	Expenditures at fastfood establishments.
cafeteria	5.0341	11.5449	Expenditures at cafeteria establishments.
breakfast	3.1900	9.8633	Expenditures on breakfast meals.
lunch	14.6965	23.7734	Expenditures on lunches.
dinner	22.7619	39.7733	Expenditures on dinners.
between meals	5.3577	10.7904	Expenditures on Between meals.
Independent Variables			
income	32.1826	21.7769	Annual household income ($1000's).
household size	2.7195	1.3998	Number of persons in household.
social assistance	0.0786	0.2692	= 1 if household receives social assistance.
age	45.5044	16.3189	age of household head.
sex	0.2973	0.4571	= 1 if household head is female.
education	0.3676	0.4822	= 1 if household head has post secondary education.
marital status	0.6604	0.4736	= 1 if two headed household.
persons < 5	0.0547	0.1321	proportion of household less than 5 years old.
urban	0.8940	0.3078	= 1 if household is located in an urban area.
provinces (Ontario, omitted based group)			
Atlantic	0.1993	0.3995	= 1 if household resides in the Atlantic Provinces.
Quebec	0.1917	0.3936	= 1 if household resides in Quebec.
Manitoba & Sask.	0.1378	0.3447	= 1 if household resides in Manitoba or Sask.
Alberta	0.0997	0.2997	= 1 if household resides in Alberta.
British Columbia	0.1299	0.3362	= 1 if household resides in British Columbia.
seasons (fourth quarter, omitted base group)			
first quarter	0.2566	0.4369	= 1 if household was interviewed during 1st quarter
second quarter	0.2504	0.4333	= 1 if household was interviewed during 2nd quarter
third quarter	0.2454	0.4303	= 1 if household was interviewed during 3rd quarter
no. of earners	1.4233	1.0090	number of earners in household.
wages	26.7672	20.5748	Annual household salaries and wages ($1000's).
occupation	0.4572	0.4982	= 1 if occup. of household head is profes. or sales

Table 2. Tobit Estimates (T-Statistics) of FAFH by Type of Establishment

Variable	Total FAFH		Table Service		Fast Food		Cafeteria
	Tobit	H Tobit	Tobit	H Tobit	Tobit	H Tobit	Tobit
constant	34.5818*	35.3468*	5.7749	13.2092*	1.2175	2.4663	-14.9008*
	(6.4006)	(7.2891)	(0.9742)	(2.3935)	(0.5086)	(1.0564)	(-7.3442)
income	0.9562*	0.9540*	0.9482*	0.8937*	0.1703*	0.1639*	0.0732*
	(10.3535)	(12.2567)	(10.0899)	(11.0394)	(4.9712)	(4.7436)	(2.3525)
household size	-6.9693*	-7.6644*	-17.4142*	-17.2624*	4.8384*	4.3490*	-0.3009
	(-3.3058)	(-4.2971)	(-6.8554)	(-7.6119)	(4.2584)	(4.2598)	(-0.3525)
household size	0.6203*	0.7222*	1.2365*	1.2787*	-0.3953*	-0.3516*	0.0962
	(2.3995)	(3.3206)	(3.8438)	(4.4738)	(-2.6015)	(-2.6607)	(0.8608)
social assistance	-14.9024*	-11.4863*	-14.5559*	-9.0724*	-8.0908*	-7.1075*	-4.1671*
	(-4.6905)	(-4.7080)	(-4.0265)	(-3.3015)	(-5.6437)	(-5.3259)	(-3.4615)
age	-0.6794*	-0.5571*	-0.3501*	-0.2696*	-0.5037*	-0.4650*	-0.1327*
	(-12.5894)	(-11.0845)	(-5.9089)	(-5.0091)	(-19.4038)	(-17.6726)	(-6.8741)
sex	-12.8514*	-11.6393*	-14.5371*	-12.2092*	-4.3321*	-4.3577*	0.8241
	(-6.4317)	(-6.6097)	(-6.8126)	(-6.1747)	(-5.1169)	(-5.3538)	(1.1398)
education	13.3740*	13.1316*	15.4771*	14.4402*	2.5632*	2.6190*	4.4887*
	(7.8699)	(8.5026)	(8.3240)	(8.3207)	(3.6256)	(3.8346)	(7.9362)
marital status	-3.8427	-3.0692	-0.2103	0.7128	-3.0471*	-3.2210*	-0.8027
	(-1.5774)	(-1.4635)	(-0.0798)	(0.3116)	(-2.7786)	(-3.1184)	(-0.9180)
persons < 5	-38.5387*	-28.5903*	-36.2266*	-27.7276*	-7.5934*	-6.3119*	-16.4999*
	(-6.7041)	(-5.5812)	(-5.2925)	(-4.5417)	(-2.8606)	(-2.4222)	(-7.2956)
urban	2.4606	1.5833	-0.4876	-0.8449	5.1414*	4.8693*	1.9098*
	(1.0814)	(0.7561)	(-0.1944)	(-0.3787)	(4.4520)	(4.4236)	(2.1372)
Atlantic	-11.1183*	-10.7535*	-17.3645*	-16.1587*	-1.4823	-1.6521	-0.6299
	(-5.1501)	(-5.4981)	(-6.9989)	(-7.3058)	(-1.6024)	(-1.8206)	(-0.8039)
Quebec	0.7866	-0.0920	4.4141	2.6590	-3.7086*	-3.5151*	1.3751
	(0.3421)	(-0.0466)	(1.7970)	(1.2505)	(-3.8331)	(-3.7413)	(1.7134)
Manitoba & Sask.	-0.3730	-1.1302	0.4035	-0.5763	-3.2391*	-3.2124*	2.6121*
	(-0.1500)	(-0.5390)	(0.1484)	(-0.2442)	(-3.0707)	(-3.2043)	(3.0528)
Alberta	6.3271*	5.1136*	8.3881*	6.3093*	-2.7461*	-2.6709*	1.1592
	(2.2068)	(2.0836)	(2.7256)	(2.3875	(-2.4295)	(-2.4042)	(1.2410)
British Columbia	2.9437	3.1277	8.1099*	6.7973*	-2.2400*	-2.0433*	0.6438
	(1.2098)	(1.4281)	(3.1175)	(2.8835)	(-2.1857)	(-2.0513)	(0.7376)
first quarter	0.3273	0.7731	-1.4574	-0.9650	1.0465	1.2359	1.2598
	(0.1622)	(0.0428)	(-0.6587)	(-0.4851)	(1.2500)	(1.5117)	(1.7722)
second quarter	4.0121*	3.4436*	2.0202	1.4181	3.0995*	2.9709*	-1.0592
	(2.0466)	(2.0021)	(0.9265)	(0.7280)	(3.6613)	(3.5983)	(-1.4569)
third quarter	3.8250*	3.4631*	3.0122	2.8703	3.5074*	3.3045*	-3.5853*
	(1.7969)	(1.9065)	(1.3224)	(1.4560)	(3.8122)	(3.7316)	(-4.8260)
no. of earners	7.0840*	6.2520*	6.9304*	5.7080*	3.4635*	3.1803*	2.6981*
	(6.0642)	(5.3343)	(5.2868)	(4.3037)	(7.2935)	(6.6495)	(6.8923)
wages	0.0554	0.0082	0.0303	-0.1081	-0.0050	-0.0158	0.1087*
	(0.5759)	(0.1099)	(0.3205)	(-1.3714)	(-0.1354)	(-0.4205)	(3.8891)
occupation	6.2163*	4.7500*	7.4377*	5.7624*	1.4531*	1.2345	2.1613*
	(3.7254)	(3.1342)	(4.0706)	(3.4307)	(1.9972)	(1.7705)	(3.6696)
variance parameters							
$\sigma_{constant}$	71.3948*	42.9800*	73.1585*	46.0355*	28.3760*	23.0166*	21.8095*
	(29.1188)	(9.3945)	(27.5258)	(9.1225)	(30.9312)	(12.8234)	(38.3472)
σ_{income}		0.5233*		0.3705*		0.1409*	
		(5.2249)		(3.5653)		(3.0741)	
σ_{wage}		0.2692*		0.3712*			
		(2.0808)		(2.7772)			
Sample 10608							
Log L.	-48927	-48490	-36592	-36336	-30590	-30534	21247
Log L. Test(df)		874(2)		512(2)		112(1)	

* Significant at the 95 percent level.

Table 3. Tobit Estimates (T-Statistics) of FAFH by Type of Meal

Variable	Breakfast		Lunch		Dinner		Between
	Tobit	H Tobit	Tobit	H Tobit	Tobit	H Tobit	Tobit
constant	-12.2319*	-4.6989	4.0292	8.1252*	11.8773*	20.5292*	-3.5193*
	(-4.8450)	(-1.3192)	(1.6139)	(3.6838)	(2.8165)	(5.5000)	(-2.6046)
income	0.1276*	0.0559	0.3814*	0.3389*	0.6720*	0.5981*	0.0261
	(4.1591)	(1.2377)	(9.8281)	(8.4092)	(9.1291)	(7.9054)	(1.6557)
household size	-4.1505*	-4.2550*	-4.5528*	-4.5162*	-6.2389*	-6.2181*	1.6401*
	(-4.2422)	(-4.4194)	(-4.0676)	(-4.7851)	(-3.3546)	(-3.6761)	(2.8879)
household size	0.2523*	0.2685*	0.4583*	0.4599*	0.3928	0.4402*	-0.1212
	(2.0265)	(2.1718)	(3.2004)	(3.9056)	(1.6434)	(2.0524)	(-1.6369)
social assistance	-5.1312*	-3.4982*	-9.8374*	-6.8907*	-13.0770*	-9.4294*	-2.1158*
	(-3.0039)	(-2.4457)	(-6.3901)	(-5.5773)	(-5.2799)	(-4.5574)	(-2.3500)
age	-0.2295*	-0.3352*	-0.2574*	-0.2536*	-0.5024*	-0.5782*	-0.2039*
	(-9.2848)	(-5.9787)	(-9.8859)	(-9.9762)	(-11.4234)	(-10.4077)	(-12.3917)
sex	-4.3687*	-4.2179*	-2.4901*	-2.5726*	-13.0408*	-11.8405*	-0.5275
	(-5.1172)	(-5.1165)	(-2.7223)	(-3.1776)	(-8.0457)	(-8.0452)	(-1.1096)
education	2.3856*	2.3280*	5.9069*	6.1068*	10.1997*	8.9458*	2.3985*
	(3.3250)	(3.4030)	(7.5893)	(8.6833)	(7.4071)	(7.2621)	(5.5798)
marital status	-0.2593	-0.7763	-1.6038	-2.2657*	-2.5651	-3.5409*	0.0882
	(-0.2586)	(-0.7923)	(-1.3797)	(-2.1628)	(-1.2956)	(-1.9990)	(0.1445)
persons < 5	-9.8486*	-6.6576*	-12.4242*	-9.5259*	-23.5578*	-15.6812*	-8.8070*
	(-3.3936)	(-2.4052)	(-4.3014)	(-3.6008)	(-4.9540)	(-3.6885)	(-5.7870)
urban	3.5293*	2.8396*	-0.3535	-1.1465	1.1084	0.5116	1.4770*
	(3.0785)	(2.4447)	(-0.3263)	(-1.1240)	(0.5800)	(0.2896)	(1.9562)
Atlantic	-3.5615*	-3.2489*	-3.1285*	-2.8173*	-10.5195*	-9.9983*	-1.6233*
	(-3.6339)	(-3.4502)	(-3.1280)	(-2.9933)	(-5.9847)	(-6.0682)	(-2.9825)
Quebec	0.7971	0.9128	2.7887*	2.0779*	-0.3370	-0.7882	-2.9430*
	(0.8415)	(1.0025)	(2.5415)	(2.1426)	(-0.1831)	(-0.4859)	(-5.4390)
Manitoba & Sask.	0.8465	0.6979	-1.6484	-1.2886	-1.4608	-2.3805	1.6942*
	(0.7851)	(0.6895)	(-1.4260)	(-1.2603)	(-0.7523)	(-1.3789)	(2.5189)
Alberta	3.0554*	2.8900*	2.0825	1.6794	2.6126	1.7243	-0.5724
	(2.6205)	(2.5838)	(1.5916)	(1.4268)	(1.1784)	(0.8543)	(-0.8996)
British Columbia	0.6482	0.6945	1.5586	1.8443	3.2989	2.9802	-0.9849
	(0.6156)	(0.6810)	(1.4190)	(1.8229)	(1.6636)	(1.6304)	(-1.7164)
first Quarter	-1.7820*	-1.3386	-0.1038	0.0345	-1.0675	-0.2605	1.3663*
	(-2.0075)	(-1.5766)	(-0.1085)	(0.0396)	(-0.6718)	(-0.1783)	(2.7397)
second Quarter	0.4581	0.5065	1.0942	1.0474	2.4485	2.0058	1.5221*
	(0.5233)	(0.6022)	(1.1673)	(1.2402)	(1.5430)	(1.3745)	(3.1083)
third Quarter	0.8194	1.0639	-0.2252	-0.1392	4.2310*	4.1773*	1.4359*
	(0.9106)	(1.2310)	(-0.2307)	(-0.1581)	(2.5288)	(2.7548)	(2.7296)
no. of earners	3.2517*	3.2024*	3.2948*	3.2733*	5.2300*	4.7269*	2.3465*
	(6.1829)	(5.6568)	(6.1317)	(6.1179)	(5.9373)	(5.4853)	(7.7513)
wages	0.0756*	0.0955*	0.0561	0.0408	-0.0187	-0.0108	0.0466*
	(2.3882)	(2.7386)	(1.4190)	(1.0121)	(-0.2438)	(-0.1438)	(2.5892)
occupation	1.2334	1.2351	4.3319*	3.5295*	4.6937*	4.0114*	0.6318
	(1.6839)	(1.7455)	(5.4025)	(4.7925)	(3.5540)	(3.3063)	(1.5174)
variance parameters							
$\sigma_{constant}$	24.3215*	13.8351*	31.7381*	16.0234*	53.8918*	22.7414*	16.3520*
	(22.0180)	(3.8452)	(42.1901)	(7.8149)	(35.9491)	(5.4923)	(15.4564)
σ_{income}		0.1148*		0.2859*		0.4336*	
		(2.5342)		(10.6391)		(8.6204)	
σ_{age}		0.1434		0.1024*		0.3249*	
		(2.5049)		(2.6425)		(3.3969)	
Sample 10608							
Log L.	-15351	-15311	-33404	-33149	-36178	-35920	-25932
Log L. test(df)		80(2)		510(2)		516(2)	

* Significant at the 95 percent level.

Table 4. Income and Household size Elasticity[a] of FAFH

	Income		Household Size	
Type of FAFH	Elasticity	T-Statistic	Elasticity	T-Statistic
Total FAFH	0.5982	11.6614	-0.2905	-4.4207
Table Service	0.7451	10.4473	-0.8494	-8.1815
Fast Food	0.3867	5.2413	0.4765	4.5081
Cafeteria	0.1586	2.3618	-0.0375	-0.2737
Breakfast	0.4681	4.4133	-0.7508	-4.7079
Lunch	0.6672	12.2954	-0.4259	-4.8681
Dinner	0.6976	10.8427	-0.3707	-3.8630
Between Meals	0.0706	1.6549	0.3469	3.0275

[a] Elasticities were computed at data means. Elasticities for the Tobit model with respect to the kth variable are obtained as $\partial E(Y)/\partial X_k(X_k/E(Y))$, where Y is the dependent variable, $E(Y) = \Phi(x_i\beta/\sigma_i)x_i\beta+\sigma_i\phi(x_i\beta/\sigma_i)$, and $\partial E(Y)/\partial X_k = \Phi(x_i\beta/\sigma_i)\beta_k$.