Does Engel's Law Extend to Food Away from Home?

Patrick J. Byrne and Oral Capps, Jr.

Engel's Law states that the proportion of income spent on food is inversely related to income level (Nicholson). This principle relates to the aggregate commodity but it cannot be assumed for disaggregate components. Food away from home (FAFH) has taken an increasingly important role in the U.S. household food budget. In fact, FAFH accounts for nearly 50 percent of the average household's food expenditures. Recent studies have demonstrated through sample expenditure elasticities that food away from home can be classified as a necessary rather than luxury good (Byrne, Capps, and Saha; Yen; McCracken and Brandt; Holcomb, Park, and Capps).

A recent study tested the hypotheses as to whether Engel's Law could be applied to various disaggregate food commodities including FAFH (Holcomb, Park, and Capps). The study was conducted using the Heckman approach for censored response analysis. The first stage of this approach is the participation decision accomplished through a probit regression. The second stage models FAFH expenditures as a function of various demographic variables and the inverse Mill's ratio obtained from the probit stage. Four functional forms were used for the second stage of the analysis: Working-Leser, double log, semi-log, and quadratic. The authors concluded that the result supported the notion that Engel's Law could be extended to FAFH; however, there are some concerns with these findings. The Working-Leser, double log, and semi-log forms inherently impose restrictions on the elasticity values. The presence of the inverse Mill's ratio was not accounted for in the calculation of elasticities which leads to inaccurate marginal effect estimation (Saha, Capps, and Byrne). Finally, results for the quadratic functional form were given for the sample means rather than over a range of income levels. Consequently, the conclusions of the study may not be appropriate.

The objectives of this study were to determine: (1) which factors directly affect the food away from home budget share; and (2) whether Engel's Law can be extended to food away from home, regardless of income level. A two-step decision process was used for estimation of the model. All observations were utilized in both steps and corrected marginal effects and elasticities were calculated.

Data

The National Panel Diary (NPD) Survey data, covering the 1982-1989 period, provide household FAFH consumption information with corresponding socio-economic and demographic information. This privately collected data source began in 1976 as a service to the restaurant industry. Approximately 12,800 households participate in the survey each quarter. FAFH information is collected for the two-week diary period for each household visit. For this analysis, information was aggregated over the two-week period by household. Dumagan and Myers provide a detailed description for the NPD data.

Variables used for this analysis are defined in Table 1. Descriptive statistics for these variables are provided in Table 2. Over the study period, the proportion of biweekly household income spent on food away from home (FAFHS) ranged from 4.5 percent to 4.8 percent.

Theoretical Framework

For FAFH consumption analysis, labor participation by the household manager has been shown to have a positive relationship with FAFH participation likelihood and expenditures (McCracken and Brandt; Yen; Byrne, Capps, and Saha). Byrne, Capps, and Saha used the NPD data for total FAFH analysis. To remain consistent with this previous study, the framework used in

The authors are Assistant Professor, Food and Resource Economics Department, University of Florida and Professor, Department of Agricultural Economics, Texas A&M University, respectively. This manuscript is Florida Agricultural Experiment Station Journal Series No. R-05173.

the total FAFH analysis can be adapted for FAFH budget share as:

$$(1) \qquad S_j = f_j(t_w, M, D)$$

where S represents FAFH budget share by the *j*th household, t_w represents hours worked by the household manager, M denotes income, and D refers to other socio-demographic characteristics. Households with working food managers are hypothesized to be more likely to purchase FAFH due to time constraints for the household's production function.

Methodology

FAFH consumption has been characterized as a two-step decision process. First, the decision is made on whether or not to consume FAFH, known as a participation stage. Second, the decision is made with respect to the level of consumption or expenditure to be made at the facility, referred to as the expenditure level decision. For this study, the decision in the second step is made with respect to the proportion of income devoted to FAFH expenditures.

Prior to the McCracken and Brandt study, empirical analyses dealing with FAFH consumption by household used a single equation ordinary least squares (OLS) procedure (e.g., Prochaska and Schrimper; Sexauer). Ignoring the multi-step nature of the decision process leads to potential bias and inconsistency concerns that result from censored responses. McCracken and Brandt sought to avert this concern through the use of the Tobit technique. The Tobit procedure estimates effects of the explanatory variables on the participation decision and the level decision from a single parameter estimate; however, the single parameter paradigm of the Tobit model restricts the directional effects to be the same for both the participation decision and the expenditure level decision. In the case of FAFH budget share, households in one region of the country may be more likely to consume FAFH then households in other regions; however, their FAFH budget shares may be less than those in other regions due to types of FAFH consumed or regional price differences.

Noting the concerns with OLS and Tobit analysis, Yen employed the use of Cragg's double hurdle model. With the double hurdle model, the ability to estimate separate parameters is achieved for both decisions. Yen employed the double hurdle to account for zero expenditure occurrence that may have resulted from purchase infrequency. The BLS Consumer Expenditure Diary Survey, used for the Yen study, represents a one-time accounting of expenditures for a one-week period. Consequently, the likelihood of purchase infrequency was assumed to be high. Purchase infrequency would not appear to be a major concern with the NPD data, due to the quarterly two-week reports.

Amemiya's two-step approach uses all of the observations in both steps, unlike the traditional Heckman approach. The first step is a probit regression to determine probability of participation or consumption. From the probit estimation, the inverse Mill's ratio is calculated and employed in the second step as an instrument which approximates a representation of the unobservable influences on the participation decision. The second stage of the estimation process incorporates the use of the censoring latent variables (inverse Mills ratio) in the quantity or budget share regression. According to Heien and Wessells, this approach provides improved results based on goodness-of-fit statistics and prior expectations of elasticity values. The technique yields separate parameter estimates for each decision stage and uses all of the observations for both stages. Heien and Wessells conclude that not only is this procedure computationally simple but also it is consistent and asymptotically more efficient than other two-step estimators. Byrne, Capps, and Saha used this approach for the aforementioned total FAFH expenditure analysis with the NPD data.

FAFH Participation Decision

Income, household size, household manager labor participation, regionality, urbanization, race, education, gender, marital status, and seasonality are identified as potential influences on the decision to consume FAFH. Table 1 defines all of the variables used in the analysis. The probit procedure to estimate the probability of FAFH participation (P[DEC=1]) can be expressed as (Chow):

$$(2)\ P[DEC=1] = \Phi(\beta' x) = \int_{-\infty}^{\beta' x_i} \frac{1}{\sqrt{2\pi}} e^{\frac{-t^2}{2}} dt,$$

where

$$(3)\ \beta' x = \beta_0 + \beta_1 INC + \beta_2 INC^2 + \beta_3 INC{*}HSIZE + \beta_4 HMHOUR + \beta_5 MW + \beta_6 SO + \beta_7 WE + \beta_8 MS2 + \beta_9 MS3 + \beta_{10} MS4 + \beta_{11} BLAC + \beta_{12} OTHE + \beta_{13} HISP + \beta_{14} HSIZE + \beta_{15} HSIZE^2 + \beta_{16} COLL + \beta_{17} GEN + \beta_{18} SING + \beta_{19} Q2 + \beta_{20} Q3 + \beta_{21} Q4.$$

Φ () denotes the cumulative distribution function of the standard normal distribution. The quadratic functional form with respect to income and household size was used to capture possible economies of scale effects in the probability of participation. Dummy variables were specified to capture seasonal variations in expenditures by quarters. The NPD quarters are defined as: 1) December to February (base group); 2) March to May (Q2); 3) June to August (Q3); and 4) September to November (Q4). For probit analysis, the probability of not consuming FAFH (P[DEC=0]) is expressed as:

$$(4)\ P[DEC=0] = 1 - \Phi(\beta' x).$$

The parameters estimated with the probit technique are not directly interpretable with respect to the magnitude of effect, but only interpretable with respect to the direction of effect on the probability. The marginal probability elasticity, at the sample means, is defined for continuous variables as:

$$(5)\ MPE_x = \Phi(\beta' \bar{x})\, \beta * \frac{\bar{x}}{P[DEC=1]},$$

where MPE refers to the marginal probability elasticity with respect to the x variable. For dichotomous variables, a marginal probability effect (ME) is more appropriate and meaningful. The ME is calculated as:

$$(6)\ ME_x = P\,[DEC=1 \mid x=1] - P[DEC=1 \mid x=0]$$

The goodness of fit statistic for this stage is the Cragg-Uhler R^2, a variation of the conventional McFadden R^2 statistic. Prior to 1986, information was not collected for the Hispanic variable and as such there is not a β_{13} estimated for these years.

FAFH Budget Share Decision

The specification of the budget share equation differs somewhat from the participation decision specification. Contributions by household members are thought to differ by the age and gender of the household member. Previous studies have used demographic translations for household composition, which yield an estimated parameter for each age-gender classification (Heien and Wessells; McCracken and Brandt). This method includes each specific classification and preserves the linearity of the specification; however, the relative contribution by each household member cannot be retrieved. Further, the translation method precludes the estimation of a household size elasticity. Demographic scaling results in a nonlinear specification, but does preserve the contribution of each household member type and allows a form of household size elasticity measurement.

Household size was defined in terms of adult equivalences, rather than a simple sum of household members. It is assumed that individuals do not necessarily contribute equally. Differences may occur as a result of age and gender. As such 11 adult equivalence variables were used to capture these differences:

AES1 - males less than 13
AES2 - males 13-21
AES3 - males 22-34
AES4 - males 35-49
AES5 - males 50-64
AES6 - adults over 64
AES7 - females less than 13
AES8 - females 13-21
AES9 - females 22-34
AES10 - females 35-49
AES11 - females 50-64

Coefficients associated with the AES coefficients were estimated simultaneously with the structural coefficients of the model, resulting in a highly nonlinear estimation procedure. The coefficient associated with males from 35 to 49 years of age was set to one. Relative contributions of other

household members as represented by parameter estimates are a comparison to the base group.

Other variables added to the specification include: 1) number of FAFH visits during the two-week period (OFAF); and 2) proportion of FAFH visits made on the weekend (OWK). The participation level of the household manager in the labor force (HMHOUR) was omitted from the budget share specification. Market labor hours constrain the amount of time available for household production and so is assumed to have a positive effect on the decision to consume FAFH. However, once the decision to consume FAFH is made, there is little basis to suggest that the number of hours worked would affect the actual share level.

McCracken and Brandt used the wage rate for household managers in both estimation steps, because Tobit estimation requires the same vector of predetermined variables for both estimation stages. Yen's study did not include the wife's income for the household income measure variable. Therefore, the wife's wage rate was used in the expenditure stage as an indication of additional household income. For this analysis, household income includes the household manager's income (if any) and the constraint on household production time is specified in hours rather than as a wage rate. Consequently, there is no theoretical or statistical restriction necessitating the inclusion of the labor participation variable in the budget share relationship.

The resulting specification for the FAFH budget share decision is:

$$
\begin{aligned}
(7)\quad FAFHS = {} & \alpha_0 + \alpha_1 INC + \alpha_2 INC^2 + \alpha_3 MW + \alpha_4 SO \\
& + \alpha_5 WE + \alpha_6 MS2 + \alpha_7 MS3 + \alpha_8 MS4 + \\
& \alpha_9 BLAC + \alpha_{10} OTHE + \alpha_{11} HISP + \\
& \alpha_{12}(\Sigma\mu_i AES_i) + \alpha_{13}(\Sigma\mu_i AES_i)^2 + \\
& \alpha_{13} INC(\Sigma\mu_i AES_i) + \alpha_{15} COLL + \alpha_{16} GEN + \\
& \alpha_{17} SING + \alpha_{18} MILLS + \alpha_{19} OWK + \alpha_{20} Q2 + \\
& \alpha_{21} Q3 + \alpha_{22} Q4 + \alpha_{23} OFAF + \varepsilon_j ,
\end{aligned}
$$

where variables are as defined in Table 1. The model is nonlinear in parameters because the set of parameters corresponding to AES, μ, is simultaneously estimated with the parameters. This specification is similar to the Working-Leser specification except income is specified quadratically. The SAS statistical package was used for empirical estimation of the expenditure equation using the PROC MODEL procedure. The participation decision was estimated with the SHAZAM econometrics package, which also calculates the values of the inverse Mills ratio.

Table 1. Definitions of Variables Used for Total FAFH Expenditure Analysis.

Variable	Definition
FAFHS	Proportion of biweekly income expended on FAFH for two-week period
INC	Annual household income in dollars
GEN	1 if household manager is female, 0 if male
COLL	1 if household head has at least some college, 0 if no college
HSIZE	Total number of household members
AES	Size of household decomposed by age and gender (figure 1)
BLAC	1 for black households, 0 otherwise
OTHE	1 for other races, 0 otherwise
HISP	1 if Hispanic, 0 otherwise
SING	1 if household head is single, 0 if married
MW	1 if household located in the Midwest, 0 otherwise
SO	1 if household located in the South, 0 otherwise
WE	1 if household located in the West, 0 otherwise
HMHOUR	Market labor participation of household manager in hours
MS2	1 if household located in MSA with population more than 500K but less than 1 million, 0 otherwise
MS3	1 if household located in MSA with population more than 1 million but less than 2.5 million, 0 otherwise
MS4	1 if household located in MSA with population more than 2.5 million, 0 otherwise
DEC	1 if OFA>0, 0 if OFA=0
OWK	Proportion of FAFH visits on weekends
OFAF	Number of FAFH visits

Marginal Effect Determination for the Budget Share Decision

The values of the inverse Mills ratio are dependent on the results of the participation decision. With the exception of household manager labor participation, participation decision

Table 2. Means (Standard Deviations) for Demographic and Purchase Variables, 1982-1989.

Variable	1989	1988	1987	1986	1985	1984	1983	1982
FAFHS	.0463	.0470	.0474	.0458	.0466	.0475	.0484	.0454
	(.0713)	(.0702)	(.0740)	(.0640)	(.0657)	(.0665)	(.0704)	(.0667)
INC	29280	28180	27555	26906	25203	24090	22598	23476
	(20643)	(19991)	(19275)	(18478)	(17005)	(16234)	(14374)	(14383)
GEN	.9118	.9193	.9435	.9398	.9423	.9630	.9672	.9864
	(.2835)	(.2724)	(.2309)	(.2379)	(.2332)	(.1887)	(.1782)	(.1158)
COLL	.5428	.5265	.5320	.5217	.5170	.5089	.4969	.2120
	(.4982)	(.4993)	(.4990)	(.4995)	(.4997)	(.4999)	(.5000)	(.4088)
HSIZE	2.3518	2.3467	2.438	2.482	2.475	2.580	2.648	2.865
	(1.305)	(1.302)	(1.320)	(1.316)	(1.315)	(1.337)	(1.351)	(1.302)
BLAC	.0405	.0268	.0265	.0264	.0262	.0244	.0209	.0220
	(.1970)	(.1614)	(.1605)	(.1603)	(.1596)	(.1543)	(.1432)	(.1467)
OTHE	.0124	.0110	.0104	.0111	.0108	.0103	.0108	.0105
	(.1109)	(.1041)	(.1015)	(.1048)	(.1034)	(.1008)	(.1035)	(.1021)
HISP	.0278	.0205	.0206	.0182	na	na	na	na
	(.1643)	(.1419)	(.1420)	(.1338)				
SING	.3215	.3275	.3046	.2910	.2848	.2618	.1977	.0938
	(.4671)	(.4693)	(.4602)	(.4542)	(.4513)	(.4396)	(.3983)	(.2916)
MW	.2972	.2947	.2947	.2979	.3140	.3241	.3137	.3012
	(.4570)	(.4559)	(.4559)	(.4574)	(.4641)	(.4680)	(.4640)	(.4588)
SO	.3159	.3206	.3199	.3111	.3123	.3002	.3111	.3087
	(.4649)	(.4667)	(.4664)	(.4629)	(.4634)	(.4584)	(.4629)	(.4620)
WE	.1721	.1686	.1755	.1704	.1694	.1668	.1707	.1753
	(.3774)	(.3744)	(.3804)	(.3760)	(.3751)	(.3728)	(.3763)	(.3802)
HMHOUR	23.593	23.515	14.130	12.976	13.500	13.709	12.623	12.153
	(19.099)	(19.198)	(17.854)	(17.097)	(17.158)	(17.061)	(16.579)	(16.336)
MS2	.15005	.1404	.1311	.1265	.1194	.1237	.1105	.1112
	(.3571)	(.3474)	(.3376)	(.3324)	(.3242)	(.3293)	(.3135)	(.3143)
MS3	.2108	.2087	.1981	.1941	.2035	.2008	.1837	.1807
	(.4079)	(.4064)	(.3986)	(.3955)	(.4026)	(.4006)	(.3872)	(.3848)
MS4	.1548	.1517	.1670	.1808	.1766	.1728	.1780	.1861
	(.3617)	(.3587)	(.3730)	(.3849)	(.3813)	(.3781)	(.3825)	(.3892)
DEC	.7574	.7580	.7607	.7698	.7669	.7720	.7729	.7757
	(.4286)	(.428)	(.4266)	(.4210)	(.4228)	(.4195)	(.4190)	(.4171)
OWK	38.426	38.238	38.754	39.295	38.876	38.628	37.974	38.201
	(36.149)	(36.053)	(36.120)	(36.158)	(35.986)	(35.887)	(36.073)	(36.141)
OFAF	5.981	6.008	6.042	6.045	6.062	5.982	5.743	5.838
	(6.939)	(6.935)	(6.947)	(6.856)	(6.917)	(6.802)	(6.514)	(6.509)

variables are also used in the budget share decision. Consequently, marginal effect determination for these variables must take into account their impact on the inverse Mills ratio (MILLS). Failure to do this would lead to biased estimates for the marginal effects (Saha, Capps, and Byrne). For this analysis, the marginal effect of a change in a variable **x** would be:

$$(8)\quad \frac{\partial FAFHS}{\partial x_k} = \alpha_k + \alpha_{18}\frac{\partial MILLS_i}{\partial x_k}$$

where α represents the parameter estimate for the second step. Let $m_i = \beta x_i$ where β represents the parameter estimate from the probit regression. Now solving for the latter term yields

$$(9)\quad \frac{\partial Mills_i}{\partial x_k} = \frac{\partial Mills_i}{\partial m_i}\frac{\partial m_i}{\partial x_k} = \beta_k \frac{\partial Mills_i}{\partial m_i},$$

Solving for the latter term in this equation depends on whether the household participated in

the FAFH market. For those households that did participate, it can be shown that

$$(10)\quad \frac{\partial\left[\frac{\Psi(m_i)}{\Phi(m_i)}\right]}{\partial m_i} = \frac{-m_i\Psi(m_i)}{\Phi(m_i)} - \left[\frac{\Psi(m_i)}{\Phi(m_i)}\right]^2,$$

and for non-participating households

$$(11)\quad \frac{\left[\frac{\Psi(m_i)}{1-\Phi(m_i)}\right]}{\partial m_i} = \frac{-m_i\Psi(m_i)}{1-\Phi(m_i)} + \left[\frac{\Psi(m_i)}{1-\Phi(m_i)}\right]^2$$

The bias on average can be estimated by summing the bias for each observation and dividing by the total number of observations (Saha, Capps, and Byrne). Consequently, the corrected marginal effects (CMEs) can be expressed as:

$$(12)\quad \frac{\partial FAFHS}{\partial x_k} = \alpha_k + \alpha_{18}\beta_k \frac{\partial \overline{MILLS_i}}{\partial m_i}$$

We can convert equation 12 to represent elasticities by multiplying this expression by $\frac{x_k}{FAFHS}$. We term this expression the Engel elasticity with respect to the variable x_k. The corrected Engel elasticities (λ) for income and household size (in adult equivalence terms, evaluated at the sample means) can be respectively expressed as:

$$(13)\quad \lambda_{INC} = \left((\alpha_1 + 2\alpha_2\overline{INC} + \alpha_{14}\Sigma\overline{\mu AES} + \alpha_{18}(\beta_1 2\beta_2\overline{INC} + \beta_3\overline{HSIZE})\frac{\partial\overline{MILLS_i}}{\partial m_i})\right)\frac{\overline{INC}}{\overline{FAFHS}}$$

and

$$(14)\quad \lambda_{AES} = \left((\alpha_{12} + 2\alpha_{13}\overline{\mu AES} + \alpha_{14}\Sigma\overline{INC}) + \alpha_{18}(\beta_{14} + 2\beta_{15}\Sigma\overline{HSIZE} + \beta_3\overline{INC})\frac{\partial\overline{MILLS_i}}{\partial m_i})\right)\frac{\Sigma\overline{\mu AES}}{\overline{FAFHS}}$$

(Note: Equations 13 and 14 need not be evaluated at the sample means. In particular, λ_{INC} must be less than zero at all levels of income for Engel's Law to hold.)

Participation Decision Results

Marginal probability elasticity and effect estimates are summarized in Table 3. Income and labor participation of the household manager are significantly positive influences on consumption likelihood throughout the study period. FAFH is more costly on average than at home expenditures. Higher incomes represent an increased ability to pay which would expectedly translate into a higher likelihood of consuming the more expensive alternative. FAFH is also considered a convenience good since it usually takes less time than home preparation. Consequently, increasing labor participation of the household manager would positively impact this FAFH likelihood.

Household size had a negative relationship in the early study years but this effect declined in absolute terms through 1988. Much of the growth in the FAFH industry during the 1980s was observed for the fast food industry. Fast food locations have grown substantially. This growing convenience increases the likelihood that at least one household member would frequent a location. In addition, the fast food industry provides more affordable alternatives and increasingly provides family offerings for larger households.

Households in the Midwest and South are about 2 to 4 percent more likely to consume FAFH than Northeast households, which is probably a result of regional price differences. Over the study period, differences between the West and Northeast have diminished.

Table 3. Marginal Probability Elasticities and Marginal Probability Effects for the Positive Food Away from Home Expenditure Decision, 1982-1989.

Variable	1989	1988	1987	1986	1985	1984	1983	1982
Elasticities								
INC	.1936*	.1710*	.1772*	.1834*	.1148*	.1196*	.1129*	.2217*
HMHOUR	.0260*	.0229*	.0125*	.0036*	.0086*	.0082*	.0153*	.0108*
HSIZE	.0036*	-0.0184*	-0.0176*	0.0079*	-0.0207*	-0.0107*	-0.0206*	-0.0553*
Effects								
MW	.0378*	.0356*	.0300*	.0387*	.0421*	.0415*	.0413*	.0385*
SO	.0208*	.0200*	.0177*	.0206*	.0141*	.0076	.0058	.0152*
WE	.0054	.0157*	.0167*	.0176*	.0170*	.0234*	.0224*	.0386*
MS2	.0345*	.0241*	.0316*	.0335*	.0428*	.0375*	.0251*	.0291*
MS3	.0182*	.0125*	.0188*	.0280*	.0147*	.0203*	.0206*	.0163*
MS4	-.0121*	-.0202*	-.0079	-.0087	-.0053	-.0072	.0042	.0163*
BLAC	-.0866*	-.0994*	-.0894*	-.1081*	-.0921*	-.0963*	-.0971*	-.0897*
OTHE	-.0247	-.0154	-.0163	.0042	.0028	-.0482*	-.0290	-.0629*
HISP	-.0070	-.0052	.0094	.0055	na	na	na	na
COLL	.0393*	.0337*	.0291*	.0433*	.0466*	.0460*	.0396*	.0192*
GEN	.0083	-.0065	-.0059	-.0186*	-.0349*	.0038	.0044	.0408*
SING	-.0038	.0009	.0019	.0068	.0086	.0137*	.0241*	.0604*
Q2	.0032	.0074	.0137*	.0151*	.0168*	.0087*	.0091*	.0124*
Q3	.0063	-.0012	.0055	.0134*	.0189*	.0102*	.0174*	.0074
Q4	-.0130	-.0134*	-.0022	-.0043	-.0025	-.0055	.0017	-.0083
C-U R^2	.10	.07	.07	.09	.08	.08	.07	.09
Likelihood Ratio[1]	2386*	1928*	1773*	2057*	1835*	2004*	1673*	1803*
Prediction Accuracy	.7581	.7592	.7616	.7708	.7674	.7721	.7731	.7756

* denotes significance at the .05 level

[1] Likelihood ratio test statistic $-2LOGL = 2(LogL_{restricted} - LogL_{unrestricted})$

Households in towns, suburbia, and small to medium sized cities (MS2 and MS3) are more likely to consume FAFH than rural households most likely due to differences in availability.

Blacks are about 9 percent less likely to consume FAFH than whites as a result of potentially varied ethnic preferences. Household heads with at least some college education increase the FAFH likelihood. This seemingly is a result of preference differences since income is already accounted for in the specification. Marital status, gender of the household manager, and seasonality were not consistently important influences on the decision to consume FAFH. This result does not preclude potential differences in type of location visited, trip frequency, or the types of commodities consumed. These results are identical to the aforementioned total FAFH analysis (Byrne, Capps, and Saha).

Household comparisons between overall probabilities based on factors such as region, population density, race, education, and marital status may be helpful in demonstrating the importance of individual marginal effects on the overall household behavior. Obviously, this analysis contains too many variables to include all of the alternatives. Four different demographic scenarios were constructed for illustrative purposes. Each scenario will be for average income and size households with a female household manager. Individual scenario characteristics are:

A. Northeast, MS4, white, at least some college education, single, household manager works 35 hours per week

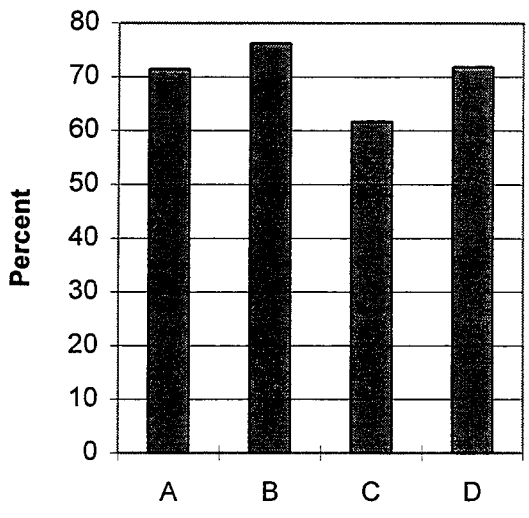
B. Midwest, MS2, white, no college, married, household manager works 35 hours per week

C. South, MS1, black, no college, married, household manager does not work

D. West, MS3, other race, at least some college education, single, household manager works 35 hours per week.

Figure 1 portrays the probabilities of FAFH consumption for each of these household scenarios during the two week period. The mean probability for all households in 1989 was 71.24 percent. Type B had the highest probability estimated at 76.22 percent. This above average likelihood was positively influenced by the Midwest region, MS2 urbanization level, college education, and the married status of the household. Type C had the lowest probability of 61.65. The negative influences were race and lack of college education. Clearly, black households have a strong negative impact on its household's likelihood to consume FAFH.

Figure 1. Four Demographic Scenarios for Household Probability to Consume FAFH During a Two-Week Period, 1989.



Budget Share Decision Results

Contrary to the participation decision, households outside of the Northeast have significantly lower budget shares than those in other regions (Table 4). Regional price differences hypothesized in the participation discussion would possibly explain this result. For those Northeast households that do consume FAFH, the higher expenditure results in a larger portion of household income expended for the commodity. Population density also has a positive impact on the budget share level, most likely a result of location availability and possibly higher price levels in the more populated areas.

Weekend visit frequency (OWK) and number of visits (OFAF) have an expectedly positive effect on the budget share as well. Weekend FAFH visits are often characterized by sit-down dining and/or entire family dining which are more costly alternatives to typical in-week visits. Hence, households that consume a higher proportion of FAFH on weekends would incur a larger expense and a resulting higher budget share than those that do not. In addition, households that have a higher frequency of FAFH visits would incur a larger expense as well, *ceteris paribus.*

Black households tend to commit less of their respective budget to FAFH than white households. This is certainly a logical consequence of their lower likelihood to consume FAFH. On a similar note, household heads with at least some college education have both higher budget shares and higher participation likelihoods than their counterparts. Female household managers have lower FAFH budget shares than male household managers, perhaps a reflection of taste differences with respect to types of food or types of locations. Seasonally, budget shares for FAFH consumption increase during the summer months (Q3) which is a popular vacation and leisure time for many U.S. households.

Using the same demographic scenarios defined for the participation decision, figure 2 illustrates the estimated FAFH budget shares for each of the four types. Type A has the largest estimated budget share at 5.54 percent, while Type C had the lowest budget share at 3.04 percent. Type B had the highest probability to consume FAFH, but the budget share was third highest. This result indicates the inverse influences of regionality for the two decisions.

Table 4. Coefficient Estimates for FAFH Expenditure Budget Share, 1982-1989.

Variable	1989	1988	1987	1986	1985	1984	1983	1982
MW	-.0061*	-.0048*	-.0039*	-.0027*	-.0011	-.0014	-.0016	-.0013
SO	-.0068*	-.0047*	-.0031*	-.0019*	-.0009	.0019*	.0030*	-.0023*
WE	-.0036*	-.0035*	-.0004	.0002	.0009	.0020*	.0025	.0033*
MS2	.0034*	.0033*	.0028*	.0015	.0024*	.0051*	.0043*	.0054*
MS3	.0050*	.0036*	.0068*	.0057*	.0067*	.0078*	.0067*	.0054*
MS4	.0083*	.0052*	.0072*	.0073*	.0060*	.0060*	.0074*	.0087*
BLAC	-.0046*	-.0048	-.0017	-.0018	-.0044*	-.0018	.0004	-.0066*
OTHE	.0026	.0024	.0020	.0003	.0142*	.0041	.0034	-.0034
HISP	.0044*	.0023*	.0060*	.0028	na	na	na	na
COLL	.0037*	.0024*	-.0002	.0001	.0021	.0023*	.0037*	.0015
GEN	-.0047*	-.0025	-.0076*	-.0019	-.0109*	-.0039*	-.0070*	-.0070*
SING	-.0019	.0044*	.0046*	.0076*	.0037	.0038*	-.0001	-.0013
Q2	.0003	-.0005	.0004	.0013	.0017	.0014	.0006	.0006
Q3	.0029*	.0024*	.0036*	.0036*	.0040*	.0044*	.0048*	.0039*
Q4	.0008	-.0006	.0014	.0011	.0003	.0001*	.0002	.0016
OWK	.0003*	.0003*	.0003*	.0003*	.0002*	.0002*	.0003*	.0003*
OFAF	.0058*	.0059*	.0058*	.0055*	.0056*	.0058*	.0059*	.0058*
MILLS	.0030*	.0022*	.0017	-.0006	-.0029*	-.0028*	-.0041*	.0010
AES1	.1898*	.2635*	.3090*	.1615*	.1440*	.1375*	.0514	-.5357
AES2	.2959*	.1046	.2091	.1775*	-.0328	.1974*	.6999*	-1.1172
AES3	.9290*	1.2790*	.6613*	1.0076*	.8725*	.8172*	.9380*	1.8110
AES4	1	1	1	1	1	1	1	1
AES5	1.0916*	1.3046	.9954*	1.0917*	1.5246*	1.2064*	1.1893*	5.0642
AES6	1.1524*	1.3567*	2.0581*	1.3537*	1.5706*	1.3002*	.9622*	2.5642
AES7	.0088	.1287	.5427*	.2974*	.2235*	.2114*	.1170	-.3596
AES8	.2682*	.3520*	.3558	.1969*	.5858*	.3585*	.6856*	-.1600
AES9	1.5542*	1.2153*	2.4499*	.9330*	1.3044*	.7071*	.2214	4.8948
AES10	1.5545*	1.6750*	2.4181	1.2580*	1.1975*	.8446*	.4553*	6.3010
AES11	1.4044*	1.7132*	2.6570 *	1.1811*	1.1763*	1.0389*	.8324*	2.6138
INC	-2.33e-06*	-2.53e-6*	-2.58e-6*	-2.32e-06	-2.60e-6*	-2.61e-6*	-3.96e-6	-3.53e-06*
INC^2	1.66e-11*	1.70e-11*	1.86e-11*	1.74e-11*	1.67e-11*	1.90e-11*	3.27e-11*	3.84e-11*
INCHS	-1.58e-07*	-6.81e-8*	-7.75e-5*	-1.29e-7*	4.01e-09	-9.51e-8*	8.82e-08*	-6.48e-08
HS	.0194*	.0174*	.0112*	.0260*	.0142*	.0225*	.0184*	.0031
HS^2	-.0012*	-.0015*	-.0004*	-.0025*	-.0014*	-.0028*	-.0040*	-.0001
R^2	.39	.42	.38	.44	.44	.43	.40	.40
MSE	.0031	.0029	.0034	.0023	.0024	.0025	.0030	.0027

* denotes significance at the .05 level

Household size, in adult equivalence terms, has demonstrated an increasingly positive influence on the budget share for FAFH (Table 5).

The corrected Engel elasticities for income would seem to support the extension of Engel's Law at the sample means (Table 5). Engel elasticities for income were fairly consistent over the study period, ranging from -.92 to -1.08 which indicates that an increase in income for the average household results in a decrease in the proportion of income expended on FAFH. This result is consistent with the Holcomb, Park, and Capps study; however, these results can only be extended to the "average" household. FAFH has been characterized as a necessary good, but this interpretation may vary by income levels. Increased availability of lower cost FAFH (i.e., fast food facilities) and increased preference for convenience may account for this trend. The adult equivalence parameter esti-

mates indicate that adults are the most influential contributors to the budget share level, but younger household members have increased in importance (Table 4).

Figure 2. Four Demographic Scenarios for Estimated Budget Share of FAFH, 1989.

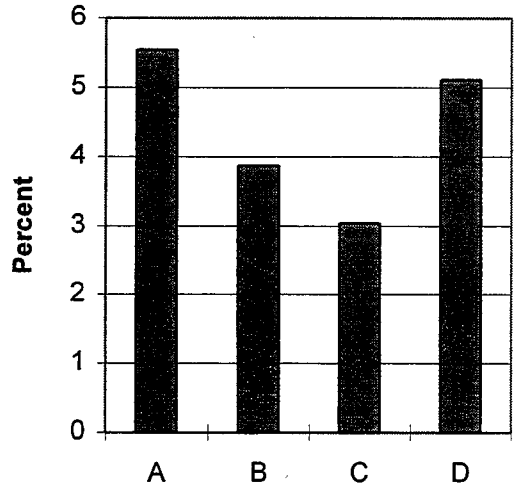


Table 5. Corrected Engel Elasticities for Income and Household Size (in adult equivalences), 1982-89.

Year	Income[a]	Household Size
1989	-1.0449	.4046
1988	-1.0671	.4001
1987	-.9891	.2892
1986	-.9262	.4942
1985	-.9380	.3449
1984	-.9224	.3697
1983	-1.0809	.2280
1982	-.9585	.0608

[a] At sample means, this set of results is consistent with Engel's Law

A closer examination by income level demonstrates that the Engel's Law extension does not hold at higher incomes for the FAFH commodity (Table 6). In 1989, income elasticity for FAFH budget becomes positive for households with total incomes of $80,000 or more. Increasing budget shares for these income levels potentially indicate a shift in preferences with respect to facility type and food type. Consequently, Engel's Law cannot be extended to all income levels.

Table 6. Corrected Engel Elasticities for Income and Household Size at Various Incom Levels for FAFH Budget Share, 1989.

Annual Income Level	Income	Household Size
$ 5,000	-.2658	.5532
10,000	-.4956	.5226
20,000	-.8473	.4614
30,000	-1.0551	.4002
40,000	-1.1191	.3390
50,000	-1.0392	.2778
60,000	-.8154	.2165
70,000	-.4478	.1553
80,000	.0637[a]	.0941
90,000	.7191[a]	.0329
100,000	1.5184[a]	-.0283

[a]These results are not consistent with Engel's Law.

Implications

Engel's Law has been a concern for the food industry. As U.S. per capita wealth continues to grow, the proportion of wealth spent on food declines resulting in a falling share of the consumer dollar for the food industry. Previous efforts have suggested that this same result can be extended to food consumed away from home. However, we must be careful not to aggregate individual household behavior and suggest that this behavior is consistent for all households. This study shows that Engel's Law does not hold for all income levels. Increases in household income levels at $80,000 or above annually give rise to higher, not smaller, FAFH budget shares. As such, FAFH becomes a more important part of the higher income household's spending dollar.

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