Spanish Demand for Food Away From Home: A Panel Data Approach

Ana M. Angulo
E-mail: aangulo@posta.unizar.es

Jose M. Gil

Jesus Mur

Paper prepared for presentation at the X^th EAAE Congress
'Exploring Diversity in the European Agri-Food System',
Zaragoza (Spain), 28-31 August 2002

SPANISH DEMAND FOR FOOD AWAY FROM HOME: A PANEL DATA APPROACH

Ana M. Angulo
Departamento de Análisis Económico. Facultad de Ciencias Económicas y Empresariales
Gran Vía, 2, 50.005 – Zaragoza. Tel.: 976761831. Fax.: 976761996.
E-mail.: aangulo@posta.unizar.es

José M. Gil
Unidad de Economía Agraria. Servicio de Investigación Agroalimentaria - DGA.

Jesús Mur
Departamento de Análisis Económico. Facultad de Ciencias Económicas y Empresariales

Abstract: In this paper, the Spanish demand for food away from home is analysed. A panel data set is built and appropriate techniques for estimating limited dependent variable models have been applied. Results indicate that where there are zero expenditures, these are largely due to infrequency of purchase rather than to abstention or to economic reasons. Furthermore, important differences appear among households. On the one hand, those households whose head is a highly-educated person, male, young and living on a salary in a large town are more likely to purchase food away from home. On the other hand, increases in income only provokes more than proportional increases in expenditure for those households headed by an unschooled person, a female or a person older than 55 and also for those households with more than half of its members older than 60 years.

Keywords: Demand for food away from home, household production theory, panel data.
JEL Classification: C23, C24, D12.
Acknowledgements: Authors want to thank the University of Zaragoza for financial support.

SPANISH DEMAND FOR FOOD AWAY FROM HOME: A PANEL DATA APPROACH

1. Introduction

Most Spanish literature on food demand has focused on consumption at home, ignoring any type of food consumption that takes place away from home. This simplifying assumption has not been unrealistic, since expenditure for food away from home (FAFH) has traditionally represented a small percentage of total food expenditure in Spain. Nevertheless, in recent years, food demand structure has changed sharply, and one of the most important changes has been the substantial increase of the FAFH expenditure share. In 1996, FAFH expenditures accounted for 25% of total food expenditure, while 20 years before it hardly reached 10%. Several factors can explain this change: the increasing percentage of women in the workforce, the growing number of households living on at least two income sources, the declining birth rate, the increasing number of one-person households, the significant decrease in the number of young married couples, and the longer life expectancy, among other factors. Clearly, these multiple demographic, social, economic and lifestyle changes have, in one way or another, generated an increase in the opportunity cost of consumers' time which, in turn, has provoked an increasing demand for time-saving food products such as FAFH.

Taking into account these new food trends, the objective of the paper is to provide a better understanding of all those economic and sociodemographic factors associated with Spanish FAFH expenditures. Results of this study should be of help to FAFH providers in forming better marketing strategies, anticipating future trends in the market, making better use of resources and identifying new business opportunities. Additionally, policy makers can apply these results so as to interpret changes in eating patterns as they apply to dietary quality and public health. Nutrition intervention programs or information and labelling legislation may be called for.

In this paper the Spanish demand for FAFH will be analysed within the context of household production theory. This is not a new framework, other studies in the United States have also adopted this approach (Kinsey, 1983; McCracken and Brandt, 1987; Soberon-Ferrer and Dardis, 1991; Nayga and Capps, 1992; Yen, 1993; Nayga and Capps, 1995; or Jensen and Yen, 1996). For Spain, only Manrique and Jensen (1998) have analysed the FAFH expenditure using data from the Household Budget Survey 1990-91, elaborated by the *Instituto Nacional de Estadística* (INE), to which they applied switching regression techniques. However, all the above-mentioned studies have used cross-section data sets, which have certain limitations. Baltagi and Griffin (1995), among others, have shown that when only a pure time series data set is used, it is impossible to control for unobservable taste changes that occur over time. Cross-section data sets are unable to effectively control for individual-specific effects. Only when simultaneously considering the time and the cross-sectional dimensions of data are researchers likely to obtain unbiased parameter estimates and, then, more reliable results. This is the approach which is going to be employed here using the information provided by the Quarterly Household Budget Survey[1], also elaborated by the INE.

[1] The Spanish Quarterly Household Budget Survey, conducted by the *Instituto Nacional de Estadística*, provides quarterly information on FAFH expenditure using a stratified random sample of households. It also gathers information on several economic and socio-demographic characteristics for

To best communicate our methods and results, the paper is organised as follows. The next section is devoted to the theoretical model on which the analysis will rely. In Section 3, the econometric techniques are explained. Following a brief description of the data in Section 4, the main results are presented in Section 5. Lastly, the paper finishes with some concluding remarks.

2. Theoretical model

The demand for FAFH can be appropriately analysed by making use of the household production theory (Becker, 1965; Lancaster, 1971) as the time component is especially relevant for this kind of demand. In household production theory, households are assumed to be both producing and utility-maximising units. Their decision-making process focuses on the efficient use of market goods, time and human capital as inputs for the production of utility-yielding non-market goods.

Formally, every household maximises its utility function, specified as a function of the quantities of n commodities produced in the household, subject to the household production function, time constraints and full-income constraints, respectively:

$$\begin{aligned} &\text{Max. } U = U(z_1, z_2, \ldots, z_i, \ldots, z_n) \\ &\text{s.t.} \quad z_i = z_i(x, t, E) \qquad i=1,2,\ldots,n \\ &\qquad t_k = \sum_{i=1}^{n} t_{ik} + t_{wk} \qquad k=1,2,\ldots,m \\ &\qquad \sum_{i=1}^{n} p_i x_i = \sum_{k=1}^{m} w_k t_{wk} + v \end{aligned} \tag{1}$$

where U refers to the household utility function; z_i represents the quantities of commodity i produced in the household; x represents an n×1 vector of the quantities of market-purchased goods used in the production of commodity i; t represents an m×1 vector of time spent in the production of commodity i; E denotes a vector of variables reflecting the environment in which production takes place; t_k denotes the total time available for household member k; t_{ik} represents the time spent by the household member k in the production of commodity i; t_{wk} represents the time spent working in market activities by the household member k; p_i represents the price of x_i; w_k represents the household member k's wage rate; and, finally, v denotes the non-wage income.

This model leads to household-derived market-good demand equations which are analogous to derived demand equations for factor inputs in traditional production theory (Becker, 1965):

$$X_{ih} = X_i(P_h, Y_h, W_h, E_h) \tag{2}$$

---

these households. For each quarter, households are asked to record information related to a one-week period. One household stays eight consecutive quarters in the survey, theoretically. This information enables us to build a panel data set by including households remaining in the sample during a certain number of consecutive periods.

Here, X_{ih} is the h[th] household's consumption of the i[th] market good; P_h is the vector of market prices faced by the h[th] household; Y_h is the h[th] household's income; W_h is the amount of available time for the h[th] household and E_h is a vector of variables reflecting the environment. These environmental factors could reflect various household characteristics or socio-demographic elements (McCraken and Brandt, 1987).

If equation (2) is multiplied by P_{ih}, as proposed by Yen (1993) and Nayga (1998), the expenditure functions are obtained and have the following form:

$$EXP_{ih} = X_{ih}P_{ih} = f_i(Y_h, W_h, E_h) \qquad i=1,2,...,n \qquad (3)$$

where the dependent variable EXP_{ih} represents the h[th] household's weekly expenditure on market good i, with all prices normalised to unity.

Due to data unavailability, some simplifying assumptions have been adopted in (3) so as to define the Spanish demand for FAFH. Since wages are not available, the number of wage earners within a household has been included to capture, together with income, the value of the opportunity cost of time[2]. Finally, we have included the following environmental variables, E_h, which we consider most likely to affect FAFH expenditure: 1) those related to the size and composition of the household; 2) the main characteristics of the head of the household (age, gender, education level or economic activity); and 3) some regional or type-of-habitat variables.

3. Econometric framework

The estimation of model (3) to analyse the Spanish FAFH expenditure on the basis of a panel data set faces substantial econometric problems due to the large number of zero purchases reported by households. There are three main reasons for zero expenditures: i) consumers do not purchase the product at current prices and income levels (corner solution), ii) the survey period is too short to allow consumers to report any purchase of a specific product (infrequency of purchase) and, iii) consumers are not interested in buying the product (abstention).

The consideration of zero responses has lately received increased attention by researchers, mainly as applied to cross-sectional analyses. The traditional Tobit Model has been found to be appropriate when zero purchases are caused only by economic factors such as high prices or low income (corner solutions). If zero expenditures are due to an infrequency of purchase, the Infrequency of Purchase Model (IP) must be used. If, in addition to this reason, there are some consumers who, having decided to participate in the market, in the end do not buy because of economic factors, the so-called Tobit Infrequency of Purchase Model (TIP) is the model of choice. Finally, if zero expenditure responses are due to either abstention or economic factors, the Double-Hurdle Model (DH) must be applied.

In order to tackle the problem of incorporating censored dependent variables in a panel data framework, the two-stage process proposed by Chamberlain (1984) has been used. This technique has been recently used to analyse the Spanish demand for tobacco by Labeaga (1999). In the first stage, a distribution for the individual effects is specified and a reduced form model is estimated. In the second stage, a Generalised Method of Moments (GMM)

---

[2] See Nayga (1998).

Within-Group estimator proposed by Bover and Arellano (1997) is computed. This procedure simultaneously deals with serial correlation, unobserved heterogeneity, the censored nature of the dependent variable and the presence of endogenous regressors. Moreover, this estimator is asymptotically equivalent to the Minimum Distance estimator with the advantage that it is not necessary to either specify the non-linear constraints on the reduced form or estimate the nuisance parameters.

We will start by considering the initial model for the FAFH expenditure as represented by (3), within a panel data framework. First, since many households report zero expenditure, we denote the latent FAFH expenditure of household h in period t as EXP^*_{ht}. Though it is not directly observable, it is associated to the corresponding observable FAFH expenditure (EXP_{ht}). In fact, the observable EXP_{ht} is always some function of the unobservable EXP^*_{ht}. Second, since previous research clearly shows that Spaniards have habit persistence when it comes to their food demand (Gracia *et al.*, 1998; Molina, 1994, among others), we have introduced some lags of the endogenous variable as additional regressors. Finally, we will follow the common practice of substituting income with total expenditure, since income data are highly suspect. In our case, as Labeaga (1999) pointed out, total expenditure must be considered an endogenous variable since it is measured with error because of including many zero expenditures on several goods infrequently purchased

Consequently, we arrive at the following equation[3]:

$$EXP^*_{ht} = \alpha\, EXP^*_{ht-1} + \gamma\, Y_{ht} + Z'_{ht}\beta + \eta_h + \upsilon_{ht} = R*'_{ht}\,\delta + \eta_h + \upsilon_{ht} \qquad (4)$$
$$(t = 1,\dots,T;\ h = 1,\dots,N)$$

where $R*_{ht} = \left(EXP^*_{ht-1} \vdots Y_{ht} \vdots Z'_{ht}\right)'$; $\delta = \left(\alpha \vdots \gamma \vdots \beta'\right)'$; EXP^*_{ht} and Y_{ht} are, as mentioned before, the latent FAFH expenditure[4] and total expenditure, respectively; Z_{ht} is a k × 1 vector of exogenous variables such as that

$$E\left(\upsilon_{ht} \mid Z_{h1},\dots,Z_{hT},\eta_h\right) = 0 \qquad (5)$$

and η_h is an unobservable individual effect potentially correlated with Z_{ht}.

The result of not observing EXP^*_{ht} is that the conditional mean of the parameter vector will not be identified if additional assumptions concerning the conditional distribution of the error terms are not included. Following Chamberlain (1984) and Bover and Arellano (1997), we define an m × 1 vector of exogenous variables $V_h = (1, Z'_{h1},\dots,Z'_{hT}, r'_h)'$, where r_h is a vector of variables that includes non-linear terms in the Z_{ht} components as well as time independent variables. Three assumptions are made:

i) The expectation of η_h conditional on the values of the exogenous variables are parameterised as follows:

$$E\left(\eta_h \mid V_h\right) = \lambda' V_h \qquad (6)$$

[3] Only one lag of the dependent variable is included in order not to lose many degrees of freedom.

[4] The inclusion of the lagged latent rather than the lagged observed variable is intended to capture probability effects as well as consumption habits.

ii) It is assumed that the conditional expectation of the initial value of the latent endogenous variable follows:

$$E\left(EXP_{h1}^{*} \mid V_{h}\right)=\mu^{'} V_{h} \tag{7}$$

iii) Finally, as total expenditure, Y_{ht}, is considered to be an endogenous variable, the conditional expected value of Y_{ht} is assumed to be:

$$E\left(Y_{ht} \mid V_{h}\right)=\Pi_{2} V_{h} \tag{8}$$

With these assumptions in mind, the complete reduced form of the model can be expressed in matrix notation as follows:

$$\left(EXP_{h}^{*'} \vdots Y_{h}^{'}\right)^{'}=\left(\Pi_{1}^{'} \vdots \Pi_{2}^{'}\right)^{'} V_{h}+\varepsilon_{h} \qquad (h=1,\ldots,N) \tag{9}$$

where $\left(EXP_{h}^{*'} \vdots Y_{h}^{'}\right)^{'}=RF_{h}^{*}$ is a 2T × 1 vector; $\left(\Pi_{1}^{'} \vdots \Pi_{2}^{'}\right)^{'}=\Pi$ is a 2T × m matrix; and ε_{h} is a new disturbance vector.

In order to estimate the reduced form (9), first stage of the Chamberlain's (1984) procedure, different alternatives have been followed to get estimates of Π_{1} and Π_{2} matrices, respectively. To estimate Π_{1}, it has to be borne in mind that it is a parameter matrix of a reduced form of the type:

$$EXP_{h}^{*}=\Pi_{1} V_{h}+\varepsilon_{h} \tag{10}$$

This expression follows model (4) where the endogenous variable Y_{ht} has been excluded. Thus, the estimation of Π_{1} can be obtained by estimating T cross-section equations in reduced form (10)[5] (Labeaga, 1999). Note that in this kind of cross-section estimation, it is necessary to take into account the nature of zero responses. Finally, Π_{2} is estimated by applying OLS to equation (8) (Bover and Arellano, 1997; Labeaga, 1999).

Once the first stage of the procedure is accomplished, the relevant vector of parameters δ in model (4) is derived. Following Bover and Arellano (1997), these estimators are obtained as follows:

$$\hat{\delta}=\left(\sum_{h} \hat{R}_{h}^{+'} \hat{R}_{h}^{+}\right)^{-1} \sum_{h} \hat{R}_{h}^{+'} \hat{EXP}_{h0}^{+} \tag{11}$$

where the variables without the "+" superscript are:

$$\hat{R}_{h}=\left(\hat{EXP}_{h(t-1)} \vdots \hat{Y}_{h0} \vdots Z_{h}\right) \text{with } \hat{EXP}_{h(t-1)}=L \hat{\Pi}_{1} V_{h} \text{ and } \hat{Y}_{h0}=I_{0} \hat{\Pi}_{2} V_{h}$$

$$\hat{EXP}_{h0}=I_{0} \hat{\Pi}_{1} V_{h}$$

---

[5] This procedure relies on the fact that the distribution of EXP_{h}^{*} is conditional on the explanatory variables, but marginal to the effects, therefore having the same form as the joint distribution (Chamberlain, 1984).

In the above expressions I_0 represents the (T-1) × T trim operator [$I_0 = (0 \vdots I_{T-1})$]; L is the (T-1) × T lag operator [$L = (I_{T-1} \vdots 0)$]; and Z_h is now of the order (T-1) × k.

Finally, variables with the "+" superscript in (11) are obtained by transforming the corresponding variable into deviations from time means using the operator $Q = I_{T-1} - \frac{\iota\iota'}{T-1}$ [ι denoting a (T-1) × 1 vector of ones]. That is, $\hat{R}_h^+ = Q\hat{R}_h$ and $\hat{EXP}_{h0}^+ = Q\hat{EXP}_{h0}$. Obviously, this transformation eliminates the individual effects η_h.

Finally, the asymptotic covariance matrix of $\hat{\delta}$ can be consistently estimated as:

$$A\hat{V}AR\left(\hat{\delta}\right) = \left(\sum_h \hat{R}_h^{+'}\hat{R}_h^+\right)^{-1} \hat{M}'\hat{\Omega}^*\hat{M}\left(\sum_h \hat{R}_h^{+'}\hat{R}_h^+\right)^{-1} \tag{12}$$

where $\hat{M} = \sum_h \left(\hat{R}_h^+ \otimes V_h\right)$ and $\hat{\Omega}^* = (\hat{B} \otimes I_m)\hat{\Omega}(\hat{B}' \otimes I_m)$.

In this last expression $\hat{B} = \left(I_0 - \hat{\alpha} L \vdots -\hat{\gamma} I_0\right)$ and $\hat{\Omega}$ is an estimate of the 2Tm × 2Tm covariance matrix of $\hat{\Pi}$ which includes both the variance-covariance matrix of the parameters of the censored dependent variable model (cdvm):

$$\hat{\Omega}_{cdvm} = \left[diag\left\{\frac{1}{N}\frac{\partial^2 \hat{L}_t}{\partial\hat{\pi}_{1t}\,\partial\hat{\pi}_{1t}'}\right\}\right]^{-1}\left[\frac{1}{N}\sum_{h=1}^{N}\left\{\frac{\partial\hat{l}_{ht}}{\partial\hat{\pi}_{1t}}\frac{\partial\hat{l}_{hs}}{\partial\hat{\pi}_{1s}'}\right\}\right]\left[diag\left\{\frac{1}{N}\frac{\partial^2 \hat{L}_t}{\partial\hat{\pi}_{1t}\,\partial\hat{\pi}_{1t}'}\right\}\right]^{-1} \tag{13}$$

and those from the OLS estimation of Π_2.

In (13) $\hat{l}_{ht}$ represents the value of the censored log-likelihood function for household h during period t; $\hat{L}_t = \sum_{h=1}^{N}\hat{l}_{ht}$; and $\hat{\pi}_{1t}$ represents a maximum likelihood estimate of the t[th] row of Π_1.

4. Data

Data have been extracted from the Spanish Quarterly Household Budget Survey conducted by the *Instituto Nacional de Estadística* (INE). It provides information on expenditure for different types of products using a stratified random sample of 3,200 households. It also gathers information on a limited number of household characteristics including the level of education and the main activity of the head of the household, household income, household size, age and sex of family members and town size. For each quarter, households are asked to record all information during one week. Theoretically, one household stays in the survey during eight quarters; however, there is a significant percentage of households which do not remain for the whole theoretical period (Browing and Collado, 1999). In this study, a panel is built by including only the households remaining in the sample during the last eight quarters that information is available (from the first quarter of 1995 to the fourth of 1996[6]). The final sample includes information from the 217 households that have remained in the survey during all eight quarters mentioned.

Finally, we have included the following variables in our models: 1) education level (unschooled, primary school, secondary school and post secondary degree); 2) age (less than 35 years old, between 36 and 55, and more than 55 years old); 3) gender; 4) employment status (self-employed, employed and unemployed); 5) size of the town where the household lives[7] (less than 10,000 inhabitants, between 10,001 and 50,000 inhabitants, between 50,001 and 500,000 inhabitants, and more than 500,000 inhabitants); 6) number of wage earners in the household; 7) size of the household; and 8) household composition[8].

5. Results

In this section we are going to present the results of Chamberlain's (1984) two-step procedure mentioned in Section 3. We first estimate expression (9), which, in fact, means to estimate the Π_1 and Π_2 matrices. As previously mentioned, to estimate the parameters of the Π_1 matrix, it is necessary to carry out eight cross-section reduced form regressions as shown in (10). However, in this case, we have to take into account the nature of the dependent variables. So, it is imperative to decide what is the most appropriate specification in relation to zero FAFH expenditures. The Voung (1989) test has been used to select between the Tobit, IP, TIP and DH models[9]. Results indicate that among the alternative models during the eight quarters, the IP model better fits the data[10]. Moreover, in order to detect possible misspecification, the Chesher (1983, 1984) score test interpretation of the White (1982) information matrix test has been used to test for normality and heteroscedasticity both jointly and individually (skewness, kurtosis and heteroscedasticity). The selected models were properly specified since the null hypothesis of normality and homocedastic errors could not

[6] In 1997 the methodology used to collect information changed, so it still is not possible to get homogeneous information for a sufficiently large period.

[7] The inclusion of this variable is mainly due to the importance of including some regional effects in the analysis. No other regional variable is included in the survey.

[8] Household composition is measured by the percentage of household members aged: i) between 1 and 13 years old (% child); ii) between 14 and 29 years old (% adolescent); iii) between 30 and 59 (% adult); and iv) 60 and above (% elderly).

[9] It is assumed that consumers decide separately to buy and how much to buy. Therefore, independent versions of the models have been estimated. In all models in which two decisions are made (IP, TIP and DH), the following variables are included in the participation equation: age, gender, level of education, employment status and town size. In the second equation, the expenditure equation, the size and composition of the household as well as the number of earners in the household have also been included. The per capita expenditure is not included as it is considered an endogenous variable and, as mentioned in a previous section, it will be explicitly modelled through equation (8) (Π_2 parameters).

[10] Results are not presented due to space limitations, but are available from the authors upon request.

be rejected (all the score results lie between 47.8 and 59.3, lower than the critical value at the 5% level of significance, $\chi^2(44) = 60.48$). These results indicate that FAFH zero expenditures in Spain are generated because the purchase cycle is longer than the survey period length. These results are important since we can now clearly state that neither abstention nor corner solutions explain the zero responses. That is, Spanish consumers seem to like eating food away from home, and neither prices nor income are an important limitation for them. Injecting here a bit of a cultural observation, at least in Spain, an important share of FAFH expenditure is surely associated with leisure and socialising activities where a great diversity of prices serve the consumer's heterogeneity.

Although the estimates made up to this point have to be understood only as "preliminary", some conclusions can be drawn in relation to the participation equation, taking into account the sociodemographic variables which have been included in that equation. Since all the exogenous variables included in the model are binary, their effects on the participation in the FAFH market are calculated as marginal effects. Results for the years under study are shown in Table 1.

(Insert Table 1)

As can be observed, despite some quarterly variations, there seems to exist quite a stable behaviour during the period analysed. In general, the higher the level of education of the head of household, the higher is the probability of participation in the FAFH market. In relation to gender effects, most of the values are positive. Purchasing FAFH is more a male activity, which probably has to do with the still low percentage of women working out of the home. Regarding age, it is observed that those households headed by a person younger than 55 are more likely to purchase FAFH. The employment status also exerts a significant influence on the probability of participation, unemployed people being the least likely to purchase this type of food. Finally, as far as the effect of the town size, the highest probability of purchasing FAFH is found for those households living in towns with between 10,001 and 50,000 inhabitants, followed by those living in the largest towns (reference category of towns with more than 500,000 inhabitants). This picture is quite consistent with certain socio-demographic studies carried out on the Spanish population.

Finally, to obtain the necessary remaining component for the second step of Chamberlain's (1984) procedure (the Π_2 parameters), equation (8) has been estimated by OLS including the same explanatory variables as used in the expenditure equation of the IP model.

Proceeding, expressions (11) and (12) are used to calculate the parameters of interest in the consumption equation, equation (4), as well as their standard deviations. However, since the variables are expressed in deviations with respect to mean times, all time-invariant variables disappear in the equation. Thus, the only explanatory variables that remain are the lag of the FAFH expenditure and the total per capita expenditure. The estimated parameters of the lagged FAFH expenditure parameter equalled 0.124 with a t-statistic of 3.86, while the total per capita expenditure parameter was 0.004 with a t-statistic of 1.97. Hence, both estimates had the expected signs and were significant at the 5% level of significance.

One of the most interesting benefits of estimating the model on individual household data is the possibility to compute elasticities for every household in the sample, for the desired time period. In this study, short- and long-run income elasticities for the whole sample have been calculated as well as a breakdown by education, gender, age, employment status, size of the residence town, size and composition of the household and finally, by the number of income earners in the household. All of them have been calculated for the mean time period. The results are shown in Table 2.

(Insert Table 2)

As a result of the sign and magnitude of the lagged FAFH expenditure parameter, all long-run income elasticities are slightly higher than the corresponding short-run ones. This result confirms the a priori assumption of the habit persistence nature of FAFH demand. Elasticities calculated for the whole sample indicate that FAFH can be considered a necessity good. A permanent 10% increase in income only yields an increase of 7.99% in FAFH expenditure. Nevertheless, important differences in income elasticities appear for households with different socio-demographic characteristics. The higher the level of education, the lower the income elasticities are. In fact, for those unschooled household heads, FAFH turns out to be a luxury product. The effect of the age of the household head is also relevant. As the head of the household gets older, income elasticities increase. Concerning the employment status, it is observed that the lowest elasticities correspond to employed workers while, obviously, the highest values correspond to those households headed by an unemployed person. All results mentioned above are quite consistent with those expected, taking into account differences related to household characteristics. In general terms, any characteristic associated with someone of higher income level is also associated with lower expenditure elasticities.

The breakdown by town size indicates that elasticities are higher for those households living in the smallest towns. This result could also be explained by differences in average income levels. In rural areas, the smallest towns, the average income level is lower than in larger towns, which is consistent with higher expenditure elasticities. As regards differences related to household size, the lowest elasticities are associated with one-member households, but all values are quite similar. Nevertheless, household size must be always analysed in relation to household composition. For that reason, elasticities for households composed of different percentages of children, adolescents, adults and elderly have been calculated. The most remarkable results are that FAFH is a luxury product for those households with a percentage of elderly over 50%. That is, the presence of elderly persons in the household considerably increases income elasticities. On the other end of the age scale, the effect made by children is not so relevant. Finally, as the percentage of adolescents within the household increases, income elasticities lower considerably. It is notable that in those households with more than 75% adolescents, the long-run elasticity is only 0.315. Finally, analysing the effect of the number of income earners, results show that the smallest elasticity corresponds to those households with more than three earners. The only exception to this rule is seen for a small sample percentage of non-earners. The effect produced by this variable may also be reflecting, as in the case of other socio-demographic characteristics, the more generalized effect of differences in average income levels.

6. Concluding remarks

In this paper, the Spanish demand for FAFH has been analysed within the household production theoretical framework using a panel data approach. Since most literature dealing with the demand for FAFH has been based on cross-section data, this paper has tried to offer a new analytical perspective. The high percentage of zero expenditures has made it necessary to carefully select the appropriate limited dependent variable models used. The obtained results are quite consistent with the expected behaviour of Spanish households and provide a clear picture of FAFH consumer behaviour. This pattern will be of great interest for all economic agents involved in this growing sector.

Results suggest a number of points. We begin with a comment regarding the infrequent character of FAFH purchasing. Since households have to record their expenditures during only one week, results suggest that the purchase cycle is longer than a week for the vast majority of the sample. Moreover, since neither abstention nor corner solutions explain the zero expenditures, we can assume that if consumers enjoy going out to consume food, then there exists a wide range of places with different prices which could satisfy any potential demand according with their socio-economic profile.

Results also provide evidence of significant differences regarding participation and expenditure behaviour between households. In general, household heads with a higher level of education, males, young and living on a salary in large towns are all more likely to purchase FAFH. As regards expenditure, results show that an increase in income only provokes more than proportional increases in FAFH expenditure for those households headed by an unschooled person, a female or a person older than 55 and also for those households with more than half of its members older than 60 years. For the rest of the households, FAFH is a necessity good.

Further interesting research could be carried out if more desegregated data were available for prices and/or type of facilities (i.e. restaurant, tavern, fast food, etc.). This information could then be used to provide further insight into the Spanish demand for FAFH and predict marketing and future conditions for the FAFH industry. Therefore, future efforts will be aimed at these objectives.

References

Baltagi BH, Griffin JM. 1995. A dynamic model for liquor: the case for pooling. *The Review of Economics and Statistics* **77(3)**: 545-554.

Becker GS. 1965. A Theory of allocation of time. *Economic journal* **75**: 493-517.

Bover O, Arellano M. 1997. Estimating dynamic limited-dependent variable models from panel data. *Investigaciones Económicas* **21**: 141-165.

Browning M, Collado D. 1999. The response of expenditures to anticipated income changes: panel data estimates. *Working Papers*, WP-AD 99-19. Instituto Valenciano de Investigaciones Económicas (IVIE).

Chamberlain G. 1984. Panel data. In: *Handbook of Econometrics Vol.2,* Griliches Z, Intriligator M (eds). North-Holland, Amsterdam.

Chesher A. 1983. The Information Matrix Test. Simplified Calculation Via a Score Test Interpretation. *Economics Letters* **13**: 45-48.

Chesher A. 1984. Testing for neglected heterogeneity. *Econometrica* **52**: 865-872.

Gracia A, Gil JM, Angulo AM. 1998. Spanish food demand: a dynamic approach. *Applied Economics* **30**: 1399-1405.

Jensen HH, Yen ST. 1996. Food expenditure away from home by type of meal. *Canadian Journal of Agricultural Economics* **44**: 67-80.

Kinsey J. 1983. Working wives and the marginal propensity to consume food away from home. *American Journal of Agricultural Economics* **65**: 10-19.

Labeaga JM. 1999. A double-hurdle rational addiction model with heterogeneity: Estimating the demand for tobacco. *Journal of Econometrics* **93**: 49-72.

Lancaster K. 1971. Consumer demand. Columbia University Press: New York.

Manrique J, Jensen HH. 1998. Working women and expenditures on food away-from-home and at-home in Spain. *Journal of Agricultural Economics* **49(3)**: 321-333.

McCraken VA, Brandt JA. 1987. Household consumption of food away from home: total expenditure and by type of food facility. *American Journal of Agricultural Economics* **69**: 274-284.

Molina JA. 1994. Food demand in Spain: An application of the Almost Ideal System. *Journal of Agricultural Economics* **45(2)**: 252-258.

Nayga RM. 1998. A sample selection model for prepared food expenditures. *Applied Economics* **30**: 345-352.

Nayga R, Capps O. 1992. Determinants of food away from home consumption: an update. *Agribusiness* **8**: 549-559.

Nayga R, Capps O. 1995. Factors affecting the probability of consuming fish and shellfish in the away from home and at home markets. *Journal of Agricultural and Applied Economics* **27**: 161-171.

Soberon-Ferrer H, Dardis R. 1991. Determinants of household expenditures for services. *Journal of Consumer Research* **17**: 385-397.

Vuong QH. 1989. Likelihood ratio test for model selection and non-nested hypotheses. *Econometrica* **57**: 307-333.

White H. 1982. Maximum likelihood estimation of misspecified models. *Econometrica* **50**: 1-25.

Yen ST. 1993. Working wives and food away from home: the Box-Cox double hurdle model. *American Journal of Agricultural Economics* **75**: 884-895.

Table 1. Effects of variables on participation in the FAFH market [a]

Group of households	1995:1	1995: 2	1995: 3	1995: 4	1996: 1	1996: 2	1996: 3	1996: 4
Level of education								
Primary school	-0.193	0.008	0.032	-0.098	-0.154	-0.034	-0.058	0.082
Secondary school	0.152	-0.037	0.099	0.233	0.234	0.078	0.191	0.067
Post secondary degree	0.280	0.008	-0.103	0.178	0.220	0.391	0.045	0.174
Gender of the head of the household								
Male	0.055	-0.068	-0.091	0.090	0.168	0.084	0.018	-0.037
Age of the head of the household								
Less than 35	0.096	0.081	-0.030	-0.028	0.213	0.068	0.189	0.242
Between 36 and 55	0.163	-0.053	0.075	0.237	0.113	0.012	0.150	0.084
Employment status								
Self-employed	-0.033	0.184	0.079	-0.036	-0.025	0.135	-0.007	0.129
Employed	0.241	-0.025	0.032	0.241	0.217	0.054	0.221	0.134
Size of the town where the household lives (Number of inhabitants)								
< 10,000	-0.094	0.090	0.005	-0.109	0.046	-0.075	-0.058	-0.184
10,001 - 50,000	0.196	0.209	0.035	0.295	-0.004	0.057	-0.047	0.361
50,001 - 500,000	-0.031	-0.083	0.031	-0.028	-0.062	-0.057	0.094	0.001

[a] The reference category is formed by those households headed by an unschooled, female, older than 55 and unemployed persons who live in towns with more than 500,000 inhabitants.

Table 2. Breakdown of income elasticities

Group of households	Short-run	Long-run
All households (100.0)[a]	0.700	0.799
Level of education		
Unschooled (23.5)	1.466	1.673
Primary school (40.1)	0.728	0.831
Secondary school (26.7)	0.595	0.678
Post secondary degree (9.7)	0.575	0.657
Gender of the head of the household		
Male (79.6)	0.626	0.715
Female (20.4)	1.118	1.276
Age of the head of the household		
Less than 35 (14.3)	0.452	0.516
Between 36 and 55 (39.5)	0.654	0.746
More than 55 (46.2)	1.007	1.149
Employment status		
Self-employed (13.0)	0.670	0.765
Employed (39.2)	0.561	0.640
Unemployed (47.8)	0.991	1.131
Size of the town where the household lives		
Less than 10,000 (32.7)	0.853	0.974
Between 10,001 and 50,000 (9.7)	0.676	0.772
Between 50,001 and 500,000 (43.4)	0.694	0.792
More than 500,000 (14.2)	0.605	0.691
Size of the household		
1 member (9.2)	0.612	0.699
2 members (24.5)	0.805	0.918
3 members (21.8)	0.686	0.783
4 members (27.9)	0.674	0.769
5 members (8.9)	0.721	0.823
More than 5 members (7.7)	0.622	0.709
Household composition		
% of children less than 25% (79.7)	0.723	0.825
% of children between 26 and 50% (19.4)	0.636	0.726
% of children between 51 and 75% (0.9)	0.274	0.313
% of children over 75% (0.0)	-	-
% of adolescents less than 25% (58.6)	0.732	0.835
% of adolescents between 26 and 50%	0.782	0.892
% of adolescents between 51 and 75% (7.8)	0.733	0.836
% of adolescents over 75% (21.1)	0.276	0.315
% of adults less than 25% (33.8)	0.747	0.853
% of adults between 26 and 50% (49.5)	0.784	0.894
% of adults between 51 and 75% (11.2)	0.547	0.624
% of adults over 75% (5.5)	0.553	0.631
% of elderly less than 25% (63.4)	0.603	0.688
% of elderly between 26 and 50% (11.8)	0.723	0.825
% of elderly between 51 and 75% (4.8)	1.088	1.241
% of elderly over 75% (20.0)	1.243	1.419
Number of income earners in the household		
No members (0.7)	0.470	0.536
1 member (44.0)	0.768	0.876
2 members (40.7)	0.628	0.717
3 members (11.5)	0.779	0.889
More than 3 members (3.1)	0.566	0.646

[a] The value in parenthesis indicates the percentage of the sample.