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Abstract

Current changes underway in Spain are likely to lead to changes in demand for different types of seafood products. Double-hurdle models were used to model Spanish household expenditures on these goods, explicitly accounting for the value of women's time in the case of processed seafood goods. The empirical evidence shows that the set of statistically significant factors in the participation and expenditure equations is not the same for fresh and processed seafood goods. The value of women's time (for expenditures on frozen, cured and canned seafood goods), income, and household demographic variables are important determinants of both participation and expenditures on seafood products.

Key Words: fresh and processed seafood goods, Spain, value of women's time, double-hurdle models, household production theory

SPANISH HOUSEHOLD DEMAND FOR SEAFOOD PRODUCTS

Introduction

In the last years, Spain has experienced many demographic, socioeconomic and lifestyle changes that not only have affected the aggregate demand of seafood but also have affected the specific demands for different types of seafood products. Many of these changes, in one way or another, have reduced the time spent by women on different forms of household production (and other non-market activities) and have contributed to increased demand for different time saving goods and services, among them processed seafood products (frozen, cured, canned). According to the predictions of economic models of household time allocation, the demand for processed seafood products is positively affected by the value of women's time. In 1991, nearly 13% of total food expenditures were on seafood, a level that has increased steadily over the last twenty-five years. Nearly half (52%) of the seafood expenditures were for frozen, canned and cured products; the rest went to fresh products (Gracia and Albisu, 1995).

Information on key factors affecting the disaggregated demands for fresh and processed seafood products is useful in developing production and marketing programs. Few studies have been done in the US and Europe on the factors affecting the level of expenditures on fresh and processed seafood products; none is yet available for Spain. This research provides information on Spanish fresh and processed seafood consumption. We examine the factors affecting the selection and the level of expenditures on fresh and processed seafood products in Spain within the context of household production theory and pay special attention to the relationship between the value of women's time and expenditures on processed seafood goods.

Theoretical Model

Households are assumed to be both producing and maximizing utility units. In order to maximize utility, they choose the best combination of commodities subject to time, resource and technology constraints.

Formally, every household maximizes its utility function

$$U = U(Z_1, Z_2, .., Z_i, ..., Z_n) \quad (1)$$

subject to

$$Z_i = Z_i(X_i, T_i)$$

$$T = \sum_{i=1}^{n} T_i + T_w \quad (2)$$

$$\sum_{i=1}^{n} P_i X_i = V + w T_w$$

where U refers to the household utility function; Z_i represents the quantities of home-produced commodity i; X_i represents a nx1 vector of quantities of market-purchased goods used in the production of home-produced commodity i; T_i represents a kx1 vector of time spent by each of the k household members in the production of commodity i; T represents the total time available for the household; T_w is a kx1 vector of time spent working in market activities by each of the k household members; P_i is a nx1 vector of prices X_i; V represents non-wage income; w is a kx1 vector of market wages earned by each of the k household members.

Also, notice that:

$$T_w = T_w(d) \quad (3)$$

where d is a sx1 vector of household characteristics.

The solution to this problem, holding prices constant, gives the expenditure functions of the n market-purchased goods:

$$e_i = e_i(w, d, V) \qquad i = 1,...n. \quad (4)$$

where e_i represents household expenditures on market-purchased good i (among them, fresh seafood goods). In the specific case of working women and expenditures on processed seafood products, the expenditure function is:

$$procsea = f(W_w, Y, d) \qquad procsea = frozen, cured, canned \tag{5}$$

where W_w represents the value of women's time (in this paper we use women's predicted and actual market earnings as proxies for the opportunity cost of women's time) and Y represents the household's income (excluding women's market earnings). This function also includes the main demographic and economic variables expected to affect the household's expenditures on processed seafood products.

Empirical Specification

Fresh and processed seafood goods are ″inputs″ into the household's consumption of food. Households first choose to consume (or not) the market goods fresh and processed seafood and then, conditional on this choice, they decide the level of expenditures on these goods. Double hurdle models allow differentiating between variables determining the consumption of seafood goods (the participation decision) and the ones determining the level of expenditures on these goods (the consumption decision).

Formally, the empirical model describing expenditures on seafood goods is given by:

$$seafood = \beta'x + \mu \qquad (\text{if } I^* = \alpha's + \zeta > 0 \quad \text{and } \beta'x + \mu > 0) \tag{6}$$

$$seafood = 0 \qquad \text{otherwise.}$$

where seafood represents the level of expenditures on seafood goods (fresh, frozen, cured, canned); x, s are vectors of socioeconomic factors (including the value of women's time in the case of processed seafood products) affecting the participation and consumption decisions on these goods; μ and ζ are disturbance terms. I^* is a latent unobservable variable; however, we observe a dummy variable I such that I = 1 if $I^* > 0$ and I = 0 otherwise.

A generalized Heckman procedure was used to correct for selectivity bias. Note that the disturbance terms in equation (6) do not have a zero conditional mean (this occurs because the μs and ζs are generally correlated) therefore correction for nonzero conditional mean disturbances was required. In a first step, univariate probit analysis was used to get estimates of α. Then, these parameter estimates were used to compute the inverse of the Mills ratio. Correction for selectivity bias was done by adding to the expenditure equation both a correction term for self-selectivity bias (the inverse Mills ratio was used

as a proxy for it) and a new disturbance term (which has a zero conditional mean) to the expenditure equation.

Data and Variables Used

The government of Spain periodically conducts household surveys (*Encuestas de Presupuestos Familiares*) in order to collect data related to expenditures and socioeconomic characteristics of Spanish households. The latest *Encuesta de Presupuestos Familiares,* conducted between April of 1990 and March of 1991, provides the basis for this research. This survey contains data for 21,155 Spanish households. In this research, we only considered both dual-headed man-and-woman households and single-headed woman households. We did not consider single-headed man households. The final sample included 19,535 households.

Definitions of the dependent and independent variables included in the models are presented in Table 1.

Results and Discussion

We assumed endogeneity of the value of women's time in seafood consumption. As the final sample contained a large number of non-working women, we used Tobit analysis to consistently estimate the market earnings equation. The predicted values of women's market earnings (based on the Tobit estimates) were used as proxies for the market value of women's time (Manrique and Jensen).

Univariate probit analysis was used to construct estimates of the correction terms for self-selectivity bias and to find insights on the socioeconomic factors affecting the decision to consume seafood goods (see Table 2). Most demographic variables were statistically significant (44 out of 71) at a 5% significance level, suggesting that these variables are important in determining the participation decision for these goods.

Regional location in the peninsula, the number of adult and elderly family members, income (excluding women's market earnings), women's age, urban location, homeownership and employment status have a positive and statistically significant influence on the decision to consume fresh seafood

goods. In contrast, women's education, the number of children and young family members and the condition of being a single-headed woman family have a negative and statistically significant influence on this decision.

The number of children, young and adult family members and regional location in the central and northeastern parts of the peninsula have a positive and statistically significant influence on the decision to consume frozen seafood products. In contrast, urban location, income (excluding women's market earnings) and the value of women's time have a negative influence on this decision.

Income (excluding women's market earnings), the value of women's time, homeownership and regional location in the southern and northeastern parts of the peninsula have a positive and statistically significant influence on the decision to consume cured seafood products. Women's education, urban location and the condition of being a single-headed woman family have a negative effect on it.

The number of children, young, adult and elderly family members, income (excluding women's market earnings) and the value of women's time have a positive effect on the decision to consume canned seafood products. On the contrary, women's age and education, and location in the northwestern part of the peninsula have a negative effect on it.

SURE techniques were used to fit the expenditure equations, with the sample selection terms included, to gain efficiency and to account for potential contemporaneous correlation between the disturbance terms. Table 3 presents the parameter estimates for these equations. Most of the parameter estimates were statistically significant (40 out of 75) at a 5% significance level. The parameter estimates of the correction terms (or the covariance between the participation and expenditure equations) were statistically significant at $\alpha = .05$. This indicates that corrections for selectivity bias were necessary.

The opportunity cost of women's time has a positive and statistically significant effect on the level of expenditures of frozen and canned seafood goods. This result confirms predictions of economic models of household time allocation. Households with older women spend more on fresh but less on

canned seafood products than do households with younger women. This result may indicate that older families have a more traditional lifestyle than do younger families and prefer fresh seafood goods.

More educated women spend more money on fresh but less on frozen seafood goods than do less educated women. More educated women could be better informed of the nutritional and health advantages of consuming fresh seafood products than are less educated women, and, alternatively, may be located in areas where fresh seafood is more available.

Urban households spend more on fresh and less on canned seafood goods than do rural households. This may reflect the differences between urban and rural areas with respect to availability, prices and the lack of refrigeration and storage facilities (canned seafood products have longer life than fresh seafood products). Cheng and Capps (1988) also found significant differences in seafood expenditures due to urban location for the US.

In general, the number of household members is positively related to expenditures on seafood products. For instance, the number of adult and elderly family members positively affect expenditures on fresh and frozen seafood products and the number of children, and teenage and young household members positively affect expenditures on canned seafood products. This may reflect the fact that older people normally prefer fresh and frozen food while younger people prefer canned (more processed food) because it is more flavorful.

Regional location has a mixed impact on seafood expenditures. The significance of the regional variables reflects differences among regions (in taste, prices, tax structure, lifestyles, advertising, etc) that affect the level of expenditures on these goods. For instance, households located in the central and southern parts of the peninsula spend less on fresh and cured seafood than do households located outside the peninsula (reference group). In contrast, northwestern households spend more on them than do households of the reference group.

Income also has a positive influence on the level of expenditures of fresh, frozen and canned seafood products implying that these goods are normal goods. Employment status has a positive

influence on fresh seafood expenditures. Finally, the condition of being a single-headed woman family has a negative influence on the level of expenditures of canned goods.

Concluding Remarks

In this paper we used Becker's household production model to analyze the socioeconomic factors affecting the selection and the level of spending on different types of seafood goods. We used a double-hurdle approach to empirically estimate the demand for fresh and processed seafood goods.

The empirical evidence has shown that the value of women's time (for processed seafood products), income and household demographic variables are important determinants of both participation and expenditures on different seafood products. Moreover, the set of statistically significant factors in the participation and expenditure equations is not the same for each of the different seafood goods.

The analysis of expenditures confirmed predictions from household production theory: the value of women's time was positively and significantly related to the level of the household's expenditures on processed seafood goods (frozen and canned). In other words, households where women have a high opportunity cost of time tend to spend more on these goods than do households where women have a low opportunity cost of time.

The results suggest a future growing market for seafood goods based on expected increases in income and changes in social and demographic characteristics in Spain. The results of this research may help producers and marketers of seafood products to better plan marketing strategies, anticipate future trends in the market, make a better use of resources, and identify new business opportunities. For instance, promotion intended to develop markets for fresh seafood products and encourage both participation and consumption of these commodities should focus on higher-income, urban families, with older employed family heads and more family members 25 and older. Promotion intended to encourage both participation and consumption of frozen seafood should focus on families with more children, adult and elderly family members. Promotion intended to encourage participation of cured seafood should focus on high-income, rural families that own their homes and have less educated man-and- women

family heads. Promotion intended to encourage both participation and consumption of canned seafood should focus on large, higher-income families with young women family heads. Finally, promotion intended to encourage both participation and consumption of processed seafood goods should focus on households where women have a high opportunity cost of time.

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Table 1. Names and description of variables

Variable Names	Description
Dependent:	
fresh	Yearly expenditures on fresh seafood products (mill. of pesetas)
frozen	Yearly expenditures on frozen seafood products (mill. of pesetas)
cured	Yearly expenditures on cured seafood products (mill. of pesetas)
canned	Yearly expenditures on canned seafood products (mill. of pesetas)
Independent:	
children	Number of household members aged 1-14
teenager	Number of household members aged 15-17
young	Number of household members aged 18-24
adult	Number of household members aged 25-64
elderly	Number of household members aged 65 and older
otherinc	Household's income (excluding woman's market earnings)
womage	woman's age
womenic	Yearly women's market income (mill. of pesetas)
Dummy variables (yes = 1, no = 0):	
employed	household head is employed
homepay	household is a homeowner
south	household resides in the south
norteast	household resides in the northeast and east
nortwest	household resides in the northwest
central	household resides in the central region
	(omitted category: household resides out of the iberic peninsula)
urban	household resides in central city or suburban area
womeduc	woman head has at least a high school education
femhead	household is a single-headed woman family

Table 2. Participation Equations: Parameter estimates of the probit models

Variables	Fresh	Frozen	Cured	Canned
constant	-.547	-.226	-1.444	.295
	(-6.28)	(-2.76)	(-13.31)	(3.56)
womage	.007	-.001	.003	-.010
	(5.39)	(-0.16)	(1.71)	(-8.09)
womeduc	-.089	-.024	-.136	-.081
	(-2.82)	(-0.73)	(-3.10)	(-2.41)
employed	.085	-.028	-.061	.023
	(2.84)	(-1.02)	(-1.72)	(0.84)
homepay	.111	.009	.089	.004
	(3.66)	(0.32)	(2.30)	(0.15)
urban	.174	-.082	-.097	-.032
	(8.08)	(-4.15)	(-3.83)	(-1.58)
children	-.038	.043	-.023	.028
	(-2.87)	(3.50)	(-1.45)	(2.22)
teenager	-.005	.031	-.008	.041
	(-0.20)	(1.43)	(-0.29)	(1.87)
young	-.047	.071	-.011	.107
	(-3.05)	(4.94)	(-0.61)	(7.31)
adult	.099	.085	.006	.074
	(6.14)	(5.49)	(0.30)	(4.69)
elderly	.055	.038	.041	.068
	(2.44)	(1.84)	(1.60)	(3.30)
south	.475	.055	.123	-.083
	(10.20)	(1.22)	(2.05)	(-1.83)
norteast	.264	.095	.161	.006
	(5.95)	(2.22)	(2.79)	(0.14)
nortwest	.436	.051	.044	-.386
	(8.67)	(1.07)	(0.69)	(-7.93)
central	.308	.205	.042	-.073
	(6.95)	(4.77)	(0.72)	(-1.67)
otherinc	.081	-.017	.064	.054
	(10.51)	(-2.15)	(6.76)	(6.79)
femhead	-.064	-.005	-.142	-.018
	(-2.02)	(-0.15)	(-3.56)	(-0.57)
womeninc		-.019	.035	.042
		(-1.97)	(2.98)	(4.34)

Note: Asymptotic t-ratios are given in parentheses.

Table 3. Consumption Equations: Parameter estimates of the two-stage generalized Heckman models

Variables	Fresh	Frozen	Cured	Canned
constant	.059	.056	-.005	.019
	(16.63)	(16.26)	(-5.99)	(13.96)
womage	.001	.001	.001	-.001
	(3.31)	(1.17)	(0.68)	(-3.60)
womeduc	.009	-.002	.001	-.001
	(7.41)	(-2.02)	(1.56)	(-1.61)
employed	.005	.001	.001	.001
	(4.83)	(0.01)	(1.62)	(1.31)
homepay	.001	-.002	-.001	-.001
	(0.21)	(-2.07)	(-1.81)	(-0.82)
urban	.003	-.001	-.001	-.001
	(3.97)	(-1.21)	(-0.17)	(-2.46)
children	.001	.001	.001	.001
	(0.38)	(2.83)	(1.86)	(2.51)
teenager	-.001	.001	.001	.001
	(-0.46)	(1.32)	(0.65)	(4.23)
young	.001	.001	-.001	.001
	(1.13)	(1.36)	(-0.70)	(4.49)
adult	.002	.001	.001	.001
	(3.74)	(2.38)	(0.68)	(1.29)
elderly	.004	.002	.001	.001
	(4.37)	(4.29)	(0.50)	(2.73)
south	-.008	-.003	-.003	-.001
	(-4.58)	(-2.60)	(-6.36)	(-1.79)
norteast	-.003	-.001	-.002	.001
	(-1.51)	(-0.07)	(-3.90)	(0.75)
nortwest	.006	.001	.002	-.002
	(2.84)	(0.93)	(4.47)	(-2.99)
central	-.004	-.002	-.001	-.001
	(-2.43)	(-1.47)	(-3.02)	(-0.38)
otherinc	.007	.003	.001	.002
	(26.40)	(14.08)	(0.02)	(14.51)
femhead	.001	-.002	.001	-.001
	(0.49)	(-1.86)	(1.15)	(-2.13)
womeninc		.001	-.001	.001
		(3.84)	(-1.07)	(7.10)
Mills Ratio	-.072	-.058	.021	-.012

Note: Asymptotic t-ratios are given in parentheses.