Food Labeling Use and Differentiated Consumers Behavior: A Survey Analysis in Spanish Food Market

González-Roa M.C., Calatrava-Requena, J.

Department of Agricultural Economics. IFAPA, Apartado 2027, 18080 Granada (Spain)

Abstract — **Research on consumer's use of food labels have been heavily increasing in the last 20 years from some pioneering works in the eighties. Different analytical approaches to the subject may be identified in the scientific literature, among them, the analysis of the use of different types of information often labeled in food markets, and its relationship with some consumer characteristics. The paper fall into the scope of this type of approach.**

From a survey to 1500 Spanish consumers, stratified by regions (zone) and type of habitat (rural, urban and metropolitan), a composite index, made by aggregating reading frequencies of nine different types of information (calories, ingredients, expiry date, nutritional composition, etc.) has been calculated, and both an OLS and a ordered multinomial Probit models have been estimated trying to find out the relationship between the intensity of using food labels and some characteristics and features of consumers. From this analysis some conclusions have, finally, been drawn.

Keyword — **food labels, aggregate use index, consumer behavior.**

I. INTRODUCTION

Research on consumer's use of food labels have been increasing over the last two decades from some pioneering works in the mid eighties (BMRB, 1985). Literature on the subject use to cover various specific topics, trying to give answer to question of different nature, among them the following: use or not of the food label by consumers, level of use, reasons for use food labels, understanding of label content, consumer satisfaction with food label, etc. Reviews of works made on the subject in different times could be found in O'Reilly and Shine (1998), Cowburn and Stockley (2005), Williams (2006) and Grunert and Wills (2007), among others.

Nowadays, there are huge differences between european countries referring to the state of the art of research concerning food labelling. At that respect, Williams (2006) emphasizes in the need of increasing this type of research in southern european countries, where is scarce comparing to the works made in U.K. and nordics countries.

The paper deals with the level, or intensity, of use of food labels by Spanish consumers and its relationship with some consumer's features.

II. METHODOLOGY

From a survey made to 1500 Spanish consumers, stratified by regions and type of habitat (rural, urban, metropolitan) information has been gathered concerning whether or not consumers consult the following information on the food label:

- Calories
- Preservatives and colouring substances
- Expiration date
- Geographical origin
- Ingredients
- Quality certificates
- Nutritional composition
- GM components
- Health benefits

The answer was given in the three following levels:

Never (i=0)
Sometimes (i=1)
Always (i=2)

The following aggregate index of Intensity of Food Label Use (IFLU) has been made:

$$I_u = \sum_{n=1}^{n=9} i_n$$

being in the correspondent value (0, 1, 2) for the item n.

I_u lies between 0 and 18.

To analyse relationships between IFLU values and some consumer's characteristics and attitudes, two different models (OLS and Ordered Multinomial Probit) have been estimated, being I_u the dependent variable. Independent variables are explained in Table 1.

Table 1 Independent variables considered in the models

VARIABLE	DESCRIPTION
Men	1 if man, 0 if woman
Freq_Labels	Frequency of consulting food labels: scale variable from 1 (never) to 5 (always)
Under25	1 if age is under 25
25to34	1 if age is between 25 and 34
35to44	1 if age is between 35 and 44
45to54	1 if age is between 45 and 54
Over55	1 if age is over 55
No_studies	1 if have no studies
Primary	1 if Primary School
Secondary	1 if Secondary School
Voc_Training	1 if Vocational Training
Univ_Medium	1 if Universitary Medium (Short Cycle)
Univ_Higher	1 if Universitary Higher (Long Cycle)
Zone1	1 for Galicia and Asturias
Zone2	1 for Cantabria, Pais Vasco, Navarra and Rioja
Zone3	1 for Castilla-Leon
Zone4	1 for Castilla-La Mancha and Extremadura
Zone5	1 for Cataluña, Aragon and Islas Baleares
Zone6	1 for Murcia and Valencia
Zone7	1 for Andalucia
Zone8	1 for Islas Canarias
Zone9	1 for Madrid
Incorr_Org	1 if incorrect definition of organic food provided
WTP	1 if willing to pay premiums for organic food
Incorr_GM	1 if incorrect definition of GM food provided
Healthy_food	1 if tries to consume healthy food
Checking_health	1 if he check their health often
Habitat	Type of habitat: Rural, Urban, Metropolitan
Smoking	Smokes or not
Recycling	Recycles garbage or not
Exercise	Makes exercise or not
PCI	Per Capita Income

III. RESULTS AND CONCLUSIONS

The I_u average is 5,82 with a standard deviation of 4,54. This average shows a low level of IFLU among Spanish consumers. Although kurtosis index of I_u distribution (-1,63) fall within the limits of normality, it does not happen with symmetry index. In fact, Kolmogorov-Smirnov test reject the null hypothesis of normality. In despite of this fact, and taking into account the big sample size, could be admissible to consider that OLS regression coefficients have a close convergence to maximum likelihood estimates. Because of that, two alternative models have been considered: OLS and Ordered trinomial Probit, the later with the following strata:

I_u	n
<3	443
3-8	633
9-18	383

Table 2 shows the answer concerning the use of different information on food labels. Percentage lies between 12,3 % of consumers that never look at the food expiration date, and 80,6 % that never look for Genetically Modified (GM) food components.

Table 2 Frequencies of consulting topics in food labels

		NEVER	SOMETIME	ALWAYS
Calories	n	970	365	163
	%	64,7	24,3	11,0
Preservatives & colouring substances	n	744	475	279
	%	49,6	31,7	18,6
Origin	n	761	542	191
	%	50,9	36,3	12,8
Expiration date	n	184	407	906
	%	12,3	27,2	60,5
Ingredients	n	563	597	336
	%	37,6	39,9	22,4
Health	n	863	464	166
	%	57,8	31,1	11,1
Nutritional balance	n	910	368	205
	%	61,5	24,7	13,8
G.M components	n	1193	157	130
	%	80,6	10,6	8,8
Quality certificate	n	1004	372	115
	%	67,3	24,9	7,8

Table 3 shows results of the OLS and Probit models, both, after making necessary changes of the

reference level in the case of multinomial variables, leads to similar conclusions, among them the following:

As a first, logical result, *the frequency of reading food labels is related to the IFLU value.*

Table 3 Models Results

	ORDERED PROBIT		OLS REGRESSION	
VARIABLE	Coeff.	p-value	Coeff.	p-value
Constant	-2,7501	0,0000	-3,6834	0,0000
Men	-0,2858	0,0001	-0,3732	0,0178
Freq_label	0,7478	0,0000	2,0967	0,0000
Under25	0,4234	0,0023	1,0674	0,0003
25to34	0,6666	0,0000	1,0497	0,0002
35to44	0,7037	0,0000	1,4736	0,0000
45to54	0,6213	0,0000	1,3001	0,0000
No_studies	-0,3504	0,0524	0,1294	0,7061
Secondary	0,4222	0,0002	0,7708	0,0017
Voc_Training	0,2375	0,0351	0,6107	0,0126
Univ_Medium	0,5092	0,0001	0,8390	0,0039
Univ_Higher	0,3208	0,0057	0,5740	0,0242
Zone1	0,3085	0,0563	0,8355	0,0159
Zone2	0,4357	0,0058	0,7669	0,0251
Zone3	-0,0413	0,8150	0,3725	0,3317
Zone5	0,3111	0,0209	0,8141	0,0049
Zone6	0,4609	0,0016	1,1199	0,0003
Zone7	0,7269	0,0000	1,6369	0,0000
Zone8	0,0892	0,6557	0,4992	0,2414
Zone9	0,3676	0,0179	0,9753	0,0033
WTP	0,2423	0,0026	0,5688	0,0010
Incorr_GM	-0,2515	0,0044	-0,7775	0,0001
Healthy_food	0,5585	0,0000	1,3638	0,0000
Check_health	0,2529	0,0025	0,5749	0,0017

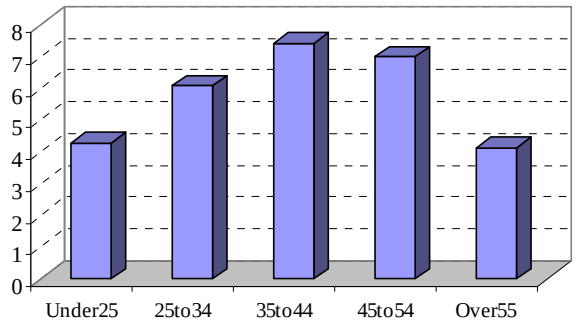
Ordered Probit Model:
Log likelihood function = -930,5330
Restricted log likelihood = -1524,867
Chi squared = 1188,668
Degrees of freedom = 23
Prob [ChiSqd > value] = 0,0000000
PCC = 71,02 %

OLS Regression Model:
F-ratio = 103,95
Degrees of freedom = 23
P-value = 0,0000
R-squared (adj. for d.f.) = 62,5613 %

There is a gender effect on IFLU, in the sense that women use to look food label information for more than men. This gender effect appears also concerning frequency of reading food labels. This fact agrees with conclusions by Wills and Grunert (2008) commenting results from 58 papers from different european countries published in the last five years.

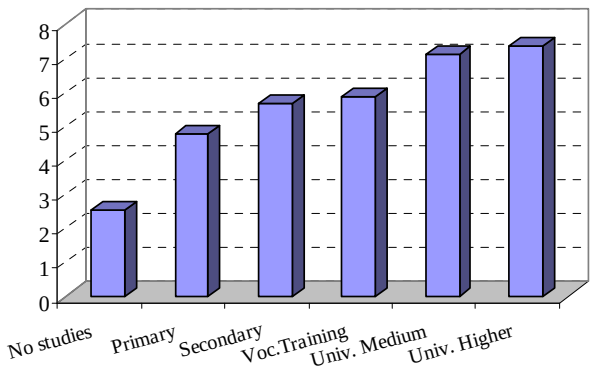
A *relationship between the value of IFLU and consumers age* has been found, in the sense that older than 55 years have a lower IFLU than the rest of consumers, and younger than 25 have a lower IFLU than consumers between 25-55 years (see Fig. 1). MAPA (2006) shows that the Spanish consumers over 35 years read more regularly food labels than the youngest.

Fig. 1 Mean IFLU values by age strata



Consumer's educational level has also been found *directly related to IFLU*, being the maximum IFLU value for consumers with university degrees (see Fig. 2).

Fig. 2 Mean IFLU values by educational level



Both the *concern for eating healthy foods* and the *practice of frequent health checking*, show significant *direct relationship with IFLU* values, and so the facts of *giving a correct definition of what a transgenic food is* and presenting a *positive willingness to pay a premium price for organic foods*.

Model coefficients show that *exist significant differences on IFLU values among regions* (zones).

Table 4 reveals some statistics of the IFLU distribution, including results from a t-test of mean differences. Cantabric Area hold the highest IFLU mean, while the area of Castilla-La Mancha-Extremadura has the lowest.

Table 4: Some statistics of the IFLU distribution by regions

	Mean*	Standard Deviation	% (I_u>8)
Asturias/Galicia	5,51 (b)	4,16	23,36
Cantabria/País Vasco/Rioja	6,42 (a)	4,42	32,64
Castilla-León	6,22 (a)	5,50	32,22
Madrid	6,22 (a)	5,00	30,25
C. Mancha/Extremadura	4,40 (c)	3,85	14,29
Cataluña/Aragón/Baleares	6,17 (a) (b)	4,61	28,57
Murcia /Valencia	5,23 (c)	4,20	25,51
Andalucía	5,93 (a) (b)	4,20	24,66
Canarias	5,33 (b) (c)	4,71	22,22

* Same letter indicates not significant (p-value>0,05) differences between means

None of the other independent variables considered have been found to have a significant (α=0,05) relationship with IFLU values. At that respect it is worth to consider the lack of significance of "per capita income" and "type of habitat". *No difference has been found in reading food labels between rural, urban and metropolitan Spanish consumers*.

Finally, from Probit model, probabilities of a given individual consumer to belong to any of the three groups of IFLU values may be calculated. Two examples follow:

- A 40 years old woman, with university degree, living in the Basque country, presenting willingness to pay for organics, giving a correct definition of transgenic food, worried for eating healthy food, and checking often her health, has a probability of 0,946 of having a IFLU value greater than 8, and a very reduced probability (0,00011) of having it smaller than 3.
- A 60 years old man with elementary studies, living in the Canary Island, who does not present a willingness to pay for organic foods, and being unable to give a correct definition of transgenic, without any concern for healthy foods and who does not check his health often, has an almost null probability (p=0,0002) of having an IFLU value greater than 8, and a probability of 0,9238 of having an IFLU value smaller than 3.

IV. REFERENCES

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