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The demand for meat and fish in Spain: Urban and rural areas

A. Gracia, L.M. Albisu*

Unidad de Economia Agraria, Servicio de Investigacion Agroalimentaria (DGA) Apdo 727, 50080 Zaragoza, Spain

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Abstract

The aim of the paper is to explain to what extent meat consumption patterns in Spain are different in rural and urban areas and which are the factors explaining differences and similarities. A demand system using cross-section data from the latest Spanish National Survey has been estimated. Unit values have been used instead of market prices and price and quality effects have been obtained. The main conclusion is that meat consumption patterns in urban and rural areas are not really different as regards economic factors. Some small income and price effect differences have been found, specially for fresh pork and fish. Responses to changes in income and price are higher for fresh pork consumption in rural areas and for fish in urban areas.

1. Introduction

Rural areas consist of small villages where inhabitants are involved in agricultural activities. The lifestyle in these areas used to be different from that of urban settlements and, therefore, food consumption patterns differed as well. These differences were due to cultural and education factors, differences in food distribution channels, income levels and age structure. However, an urbanization process has taken place in Spain in recent years. This process results in a homogenization of cultural patterns, distribution channels and, consequently, food consumption behavior.

Table 1 shows that food expenditure share is higher in rural than in urban areas but differences have smoothed out in the last decade. Nevertheless, fish expenditure share is higher in urban areas but differences have also been diminishing from 1980 to 1990. Although differences seem to be reduced, in general, expenditure on total food products (and on meat and fish) is higher in urban areas than the national average (Table 2). If the different meat categories are analyzed, expenditure on fresh pork and lamb and goat, is higher in rural areas. The same can be said if we focus on quantities consumed, but differences are lower because urban prices are higher. The consumption of beef and veal, and fish is higher in urban areas (both expenditure and quantities). However, the quantity of poultry and processed pork consumed is lower in urban areas but expenditure is higher.

Income is the other factor that can explain differences in meat consumption patterns. Salaries in urban areas are 15% above the national average, and in rural salaries 18% below. Apart from economic factors (price and income), rural and urban consumption differences can be explained by sociodemographic

*Corresponding author. Tel.: 0034967576361; fax: 0034967575501; e-mail: albisu@mizar.csic.es

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Table 1
Spanish expenditure share structure in 1980/81 and 1990/91

	Rural		Urban		Spain	
	80/81	90/91	80/81	90/91	80/81	90/91
Food	32.2	27.3	26.0	22.7	28.7	24.7
Meat	30.8	30.8	30.1	29.2	30.5	29.5
Fish	10.1	12.2	12.5	13.5	11.3	13.0

Source: INE. Encuesta de Presupuesto Familiares, 1980–81 and 1990–91.

Table 2
Expenditure on food, meat products and fish (% respect to national mean)

	Expenditure		Quantity		Price	
	Rural	Urban	Rural	Urban	Rural	Urban
Total food	93.9	105.6				
Meat	97.9	104.5	112.2	94.8	87.2	110.1
Beef and veal	79.8	116.4	85.0	113.5	93.8	102.6
Pork	123.2	85.6	140.9	76.7	87.5	111.7
Lamb-goat	134.9	92.8	146	86	92.4	107.5
Poultry	98.4	103.2	110.2	94.5	89.3	109.2
Processed pork	93.5	106.7	109	96.3	85.8	110.8
Other meats	88.9	104.1	107.8	93.2	82.3	116.1
Fish	88.5	110.1	98.5	102.9	89.9	107.0

Source: INE. Encuesta de Presupuesto Familiares, 1990–91.

characteristics such as age structure (Martinez, 1993). The population in rural areas is older than that in urban settlements.

In summary, some differences in meat consumption patterns between rural and urban areas are still observed but factors explaining those differences have changed. The cultural and educational background today is quite similar in both areas and the same distribution channels are developing all over Spain. Therefore, factors that still can explain the differences maintained mainly relate to income levels and age structure. The aim of the paper is to explain to what extent meat consumption patterns are still different in rural areas and which are the factors explaining differences or similarities.

The paper is organized as follows. Section 2 describes the data and points out problems and limitations. Section 3 shows the model and the estimation procedure. Results are presented in Sections 4 and 5 outlines the main conclusions.

2. Data definition and limitations

Data are taken from the 'Encuesta de Presupuestos Familiares' (Spanish National Expenditure Survey) from a stratified random sample of 21,155 households in Spain from April 1990 to March 1991. Households are classified into two groups: rural households, located in towns of less than 10,000 inhabitants, and urban households, located in towns of more than 100,000 inhabitants (families living in other types of settlements have not been included).

Information on expenditure and quantity purchased of different foodstuffs during one week has been collected. There are also data on a limited number of household characteristics including age and sex of family members, geographical location, household income, level of education and activity of the head of the household.

The large number of food categories has been aggregated into seven groups: (1) beef and veal, (2) fresh pork, (3) lamb and goat, (4) poultry, (5) processed pork, (6) fish and (7) the rest of the foodstuffs.

Prices have been calculated by dividing expenditure over quantities (unit values) (Cox and Wohlgenant, 1986; Teklu and Johnson, 1988; Heien and Wessells, 1988; Gao and Spreen, 1994). The problem of using unit values as prices is that unit values not only account for price variations, but also for quality choices. Quality is considered as an aggregation phenomenon since commodities are considered as a collection of heterogeneous goods, expressing more or less quality variety, among which consumers chose certain items depending on income and price changes. As income increases, consumers not only buy more, but they also consume a different quality variety of the same good. A positive relationship between the unit value and the income level is expected. Houthakker and Prais called this relationship 'elasticity of quality.' Unit value should move less than proportionally with prices. If market prices rise, not only can consumers alter the quantity, but also the quality of what they buy. The effect of this kind of substitution will be an increase in price that will generate a less than proportional increase in unit value. In this context, unit values account for quality as well as for genuine price variations. Therefore, if we regress quantities on unit values, instead of real prices, the same quantity difference will be ascribed to a smaller unit value

difference and the estimated price elasticities will be exaggerated.

To overcome this problem, Deaton (1987) suggested an estimation procedure that treats market prices as unobservable variables that affect quantities and determine observed unit values (Deaton (1988, 1990); Deaton and Grimard (1992)).

3. Model and estimation procedure

The basic premise of this model is that households chose simultaneously how much of a commodity and which quality to buy. This model takes into account two data limitations: the quality effect associated to unit values and the measurement errors related to the recording of expenditures and quantities. This specification treats market prices as unobservable variables that affect quantities purchased, and that determine observed unit values with measurement errors and quality effects. This is possible because households are surveyed in clusters of households located in the same town and they are surveyed at the same time. Therefore, they face the same market price. Within-cluster variations of purchases and unit values can be used to estimate the influence of income and socio-demographic characteristics on consumption. At this stage, unit value variations can also be used to quantify measurement errors. By contrast, unit value variations among clusters are due to variation in prices and they allow the calculation of accurate price elasticities.

In the model, quantity and quality choice are functions of income, household characteristics and prices. The model has two equations where budget shares and unit values depend on those factors. For household i in cluster c, the two equations are defined as follows:

$$w_{Gic} = \alpha_G^0 + \beta_G^0 \ln X_{ic} + \gamma_G^0 Z_{ic} + \sum_{H=1}^{n} \theta_{GH} \ln P_{Hc} + (f_{Gc} + U_{Gic}^0) \quad (1)$$

$$\ln v_{Gic} = \alpha_G^1 + \beta_G^1 \ln X_{ic} + \gamma_G^1 Z_{ic} + \sum_{H=1}^{n} \psi_{GH} \ln P_{Hc} + U_{Gic}^1 \quad (2)$$

where

w_{Gic}: budget share of food G in household i belonging to cluster c.

v_{Gic}: unit value of food G in household i belonging to cluster c.

X_{ic}: total food expenditure in household i belonging to cluster c.

Z_{ic}: household characteristics of household i belonging to cluster c.

P_{Hc}: market price of commodity H (unobserved) for cluster c.

f_{Gc}: cluster fixed effect of food G and cluster c.

U_{Gic}^0 and U_{Gic}^1: error terms.

The main feature in both equations is that prices (P_{Hc}) are not observed, and it is not possible to estimate these equations directly. Therefore, if the ψ matrix in Eq. (2) is an identity matrix, unit values and prices shift together and it will be possible to estimate Eq. (1) replacing unobserved prices by unit values. However, our hypothesis is that ψ_{GG} is a diagonal matrix with coefficient less than 1 at the diagonal (some quality effects should exist), therefore, another estimation procedure should be used.

The estimation is calculated in two stages. First, Eqs. (1) and (2) are estimated equation by equation 'within each cluster' using Ordinary Least Squares (OLS) including dummy variables for each cluster. As prices are constant across households, fixed cluster effects and market prices disappear and $\beta_G^0, \gamma_G^0, \beta_G^1$ and γ_G^1 parameters can be estimated.

At this stage, we can calculate total expenditure elasticities as well as expenditure elasticities of quantity and quality. The β_G^1 is the expenditure elasticity of quality or the elasticity of unit value with respect to expenditure. The expenditure elasticities of quantity are the total expenditure elasticities minus the elasticity of quality.

Error terms for both equations (e_{Gic}^O, e_{Gic}^1), needed in the second stage to correct the model for measurement error were calculated.

The second stage estimation begins by using the first-stage estimated parameters to calculate the corrected budget shares and unit values by removing the income and sociodemographic effects. The cluster means of the corrected variables are used in the between-cluster estimation. After averaging the following expressions are obtained:

$$w_{G.C} = \alpha_G^0 + \sum_{H=1}^{N} \theta_{GH} \ln P_{HC} + (f_{GC} + U_{G.C}^0) \quad (3)$$

$$\ln v_{G.C} = \alpha_G^1 + \sum_{H=1}^{N} \psi_{GH} \ln P_{HC} + U_{G.C}^1 \quad (4)$$

where, $w_{G.C}$ are cluster means of the corrected budget share and ln $v_{G.C}$ cluster means of the corrected unit values.

The between-cluster estimation of Eqs. (3) and (4) is given by $B=S^{-1}R$, where the elements of S and R are the variance and covariance of the budget share and unit values cluster means (s_{GH}=Cov (ln $v_{G.C}$, ln $v_{H.C}$), r_{GH} = Cov ($w_{G.C}$, ln $v_{H.c}$)).

The estimation of **B** matrix given above is correct if there are no measurement errors in cluster averages. Otherwise, if, as expected, there are some measurement errors in recording expenditures and quantities, the **S** matrix overestimates the variance and covariance of prices and **R** is also contaminated by measurement errors. The **B** matrix corrected by measurement errors is as follows:

$$\mathbf{B} = (\mathbf{S} - \Omega N_+^{-1})^{-1}(\mathbf{B} - PN^{-1}) \quad (5)$$

where, Ω and P are variance and covariance of the errors from the first stage residuals and N_+^{-1} and N^{-1} are cluster means. If we take probability limits, as the sample size goes to infinity but the cluster size remains constant, this is the result:

$$p\text{lim}\boldsymbol{B} = \boldsymbol{B} = (\psi')^{-1}\theta' \quad (6)$$

Price effects are given by the θ matrix, but this estimation procedure provides only the estimation of $\boldsymbol{B}$. If ψ is an identity matrix, $\boldsymbol{B}$=0, price effects are directly obtained. Otherwise, ($\psi \neq$I) some additional information to identify price effects is needed. This information is collected from the model defined in Eqs. (1) and (2).

If we differentiate Eq. (1) with respect to ln P_H, we have:

$$\frac{\partial \ln W_G}{\partial \ln P_H} = \frac{\theta_{GH}}{W_G} = \epsilon_{GH} + \psi_{GH} \quad (7)$$

where

ϵ_{GH}: price elasticity of quantity.
ψ_{GH}: price effect in unit value.

Assuming weak separability of preferences we have (Deaton, 1988):

$$\psi_{GH} = \delta_{GH} + \beta_G^1 \varepsilon_{GH}/\varepsilon_G \quad (8)$$

where δ_{GH} is the Kronecker delta.

Substituting the expenditure elasticity of quantity and Eq. (7) in Eq. (8) the following expression is obtained:

$$\psi_{GH} = \delta_{GH} + \frac{\beta_G^1(\theta_{GH}/W_G - \psi_{GH})}{(1-\beta_G^1) + \beta_G^0/W_G} \quad (9)$$

4. Results

The selected households have been divided into: rural households located in towns of less than 10,000 inhabitants and urban households located in towns of more than 100,000 inhabitants.

Each of the two groups has been clustered so that households within each cluster are assumed to face the same market prices. This assumption requires not only the geographical proximity of households, but also that they will be interviewed at approximately the same time. Accordingly, the classification criteria have been: (a) region of residence, and (b) month of survey.

The variables in specifications (1) and (2) are defined as follows. Income is annual household expenditure on food divided by the number of people in the household. Expenditure on food has been used because weak separability has been assumed. The sociodemographic variables are: (a) the number of members by age group, (1) 0 and 5 years old; (2) 6 and 25; (3) 26 and 45; (4) 46 and 65; and (5) over 65; (b) the percentage of income earners; (c) the proportion of males in the household and; (d) the level of education of the head of the household (4 categories).

Eq. (1) has been estimated for all households that record expenditures on food, and Eq. (2) only for those households that record at least one purchase of the analyzed product. If no purchase is recorded it is not possible to calculate the unit value. Due to the adding-up requirement, the 'other foodstuffs' equation has been removed in the estimation.

The estimated parameters β_G^0 and β_1^G are individually significant at 5% level (Tables 3 and 4). Most of the sociodemographic parameters are significantly

Table 3
First stage estimation parameters for rural households

	Beef and veal	Pork	Lamb and goat	Poultry	Processed pork	Fish
Eq. (1)						
α_G^0	−0.12*	−0.13*	−0.11*	0.13*	−0.24*	−0.11*
β_G^0	0.017*	0.010*	0.016*	−0.006*	0.024*	0.027*
≤5 years old	−0.0013	0.0016	−0.0033	−0.004*	0.003	−0.005*
6–25	0.0014	0.0065*	−0.0017*	−0.0015*	0.009*	−0.0036*
26–45	0.0039*	0.0055*	0.0008	−0.001	0.008*	0.007*
45–65	0.0016	0.0038*	0.0023*	0.0000	−0.000	0.011*
+65	0.006*	−0.0007	0.0081*	0.0006	−0.0113*	0.013*
% males	−0.007	0.013*	0.0083*	−0.0021	0.024*	−0.004
% income earners	0.012*	−0.003	−0.01*	−0.011*	0.008*	−0.0013
Educ. level 1	−0.026*	0.024*	0.0033	0.011*	0.007	−0.037*
Educ. level 2	−0.0098*	0.02*	0.0037	0.0055	0.001	−0.019*
Educ. level 3	−0.000	0.011*	−0.0044	−0.0011	0.008	0.003
Eq. (2)						
α_G^1	6*	5.73*	5.73*	5.42*	5.66*	4.59*
β_G^1	0.084*	0.075*	0.11*	0.057*	0.096*	0.19*
≤5 years old	0.012	0.0047	−0.003	−0.0134	0.0008	0.028*
6–25	−0.0003	0.0178*	0.000	0.0038	0.002	0.015*
26–45	0.004	0.02*	0.03*	0.011	0.01	0.032*
45–65	−0.004	−0.0043	0.003	−0.009	0.013*	0.007
+65	0.013	0.023*	0.023*	−0.025	0.015*	0.04*
% males	−0.016	−0.042	−0.088*	0.01	0.021	−0.007
% income earners	−0.014	0.03	−0.000	0.072*	0.057*	0.014
Educ. level 1	−0.027	−0.14*	−0.073*	−0.13*	−0.18*	−0.17*
Educ. level 2	−0.036	−0.12*	−0.055	−0.07*	−0.14*	−0.11*
Educ. level 3	0.0042	−0.1*	−0.032	−0.005	−0.075*	−0.015

*Statistically significant at 5% level.

different from zero in Eq. (1), but are not in Eq. (2). This means that sociodemographic factors influence food consumption but sociodemographic characteristics do not affect unit values except for the level of education of the head of the household.

Expenditure elasticities in rural areas are greater than one for all meat products and fish except for poultry in rural areas (Table 5). This means that meat and fish are luxury products and if food expenditure increases, the proportion allocated to different meat categories (except poultry) and fish increases more than proportionally. Therefore, meat and fish products gain participation in the household food budget and it most affects lamb and goat. Urban and rural consumption responses to changes in food expenditure are similar. However, the responsiveness of pork (fresh and processed) to changes in total expenditure is lower in urban areas, as well as for poultry and fish in rural areas.

Household size and age structure influence meat and fish consumption except for poultry. A positive relationship between budget share and the number of household members, over 26, can be observed for beef, lamb and fish in rural and urban areas. It means that if a household has an additional member over 26, the consumption of beef, lamb and fish increases, and this rise is higher in rural than in urban areas for beef and lamb and similarly for fish. When the additional member in the household is over 65, the consumption of pork (fresh and processed) decreases in both areas. This behavior seems to be related to health issues, older people tend to follow healthier diets. A positive relationship between pork (fresh and processed) consumption and the number of males in the household has been found in both rural and urban areas. However, in urban areas the consumption of beef increases but the consumption of fish decreases if the household has an additional male. It seems that males do not care

Table 4
First stage estimation parameters for urban households

	Beef and veal	Pork	Lamb and goat	Poultry	Processed pork	Fish
Eq. (1)						
α_G^0	−0.15*	−0.016	−0.09*	0.045*	−0.063*	−0.33a
β_G^0	0.023*	0.0021*	0.01*	0.0006	0.01*	0.043*
≤5 years old	−0.005*	0.0001	0.002	−0.0009	0.0014	−0.006*
6–25	−0.0006	0.0056*	0.0006	0.0004	0.007*	−0.005*
26–45	0.006*	0.003*	0.004*	−0.0005	0.0067*	0.008*
45–65	0.006*	0.0017*	0.0041*	0.0007	−0.0028*	0.011*
+65	0.0032*	−0.0018*	0.006*	0.0017	−0.01*	0.011*
% males	0.015*	0.0091*	−0.002	−0.0013	0.008*	−0.014*
% income earners	−0.012*	−0.008*	−0.005*	−0.003	0.008*	−0.013*
Educ. level 1	−0.031*	0.009*	0.0038*	0.018*	−0.005*	−0.03*
Educ. level 2	−0.013*	0.011*	0.0038*	0.017*	−0.003	−0.02*
Educ. level 3	−0.004	0.0023	0.00013	0.01*	0.002	−0.009*
Eq. (2)						
α_G^1	5.91*	5.95*	6.26*	5.39*	5.81*	4.05*
β_G^1	0.088*	0.062*	0.076*	0.071*	0.098*	0.22*
≤5 years old	−0.011	−0.0026	0.014	0.019	−0.02*	0.03*
6–25	−0.008*	−0.0037	−0.011	0.0007	−0.012*	−0.0001
26–45	0.012*	−0.002	0.016	−0.008	0.003	0.03*
45–65	0.0074	0.000	0.007	−0.015*	0.003	0.008
+65	0.012*	−0.017*	0.009	0.003	0.016*	0.021*
% males	−0.017	0.032	0.023	0.027	−0.023	0.012
% income earners	−0.007	−0.016	0.021	0.058*	0.031	0.032
Educ. level 1	−0.11*	−0.13*	−0.059*	−0.13*	−0.2*	−0.26*
Educ. level 2	−0.068*	−0.08*	−0.039*	−0.1*	−0.15*	−0.18*
Educ. level 3	−0.005	−0.041*	−0.003	−0.04*	−0.08*	−0.07*

*Statistically significant at 5% level.

much about healthy diets because they consume more meat and less fish. The level of education influences meat and fish consumption specially in urban areas. The more educated the head of the household the higher beef and fish consumption is and the lower poultry and fresh pork is. The level of education also influences unit values so that if the head of the household is more educated, unit values are higher.

All quality elasticities are positive and statistically different from zero and relatively small except for fish. In both areas, except for processed pork and fish, the estimated quality elasticities suggest a very low unit value response to food expenditure. Differences in quality effects between urban and rural areas have not been found. This means that, when income increases, urban and rural consumers do not tend much to buy higher quality items within the analyzed group.

Expenditure and sociodemographic effects have been removed from the original data and corrected budget shares and unit value means have been used to estimate accurate price elasticities according to the procedure described above.

As regards own-price elasticities, poultry consumption changes more than proportionally to its price change. It means that poultry consumption is very sensitive to price. However, price elasticities for the rest of the meat products and fish are inelastic (except for beef in rural areas). Therefore, consumption does not respond much to changes in prices. If we compare rural and urban areas, the greatest differences can be observed in fresh pork. Although, in both areas elasticities are inelastic, the responsiveness of fresh pork consumption to changes in its price is lower in urban areas. However, the opposite can be observed for fish, as the responsiveness is higher in urban areas although it is small (−0.57).

Meat and fish consumption has not yet stabilized and it can be expanded if a household would allocate

Table 5
Expenditure, quality and price elasticities at mean values

	Rural					
	Beef and veal	Fresh Pork	Lamb and goat	Poultry	Processed pork	Fish
Expenditure	1.26	1.21	1.35	0.91	1.29	1.23
E_G	1.17	1.13	1.24	0.85	1.19	1.04
Quality	0.08	0.07	0.11	0.06	0.1	0.19
Beef and veal	−1.0	−0.43	0.84	1.25	2.88	−1.81
Fresh Pork	1.47	−0.76	0.47	−0.11	−0.65	1.03
Lamb and goat	−0.13	−0.84	−0.82	1.29	2.06	−2.11
Poultry	1.55	−0.1	0.7	−1.26	1.61	−0.95
Processed Pork	0.19	−0.62	0.94	0.02	−0.01	−0.33
Fish	−0.66	−0.63	0.77	0.27	0.41	−0.34
	Urban					
	Beef and veal	Fresh Pork	Lamb and goat	Poultry	Processed Pork	Fish
Expenditure	1.27	1.06	1.45	1.01	1.11	1.32
E_G	1.18	1.00	1.37	0.94	1.01	1.1
Quality	0.09	0.06	0.08	0.07	0.1	0.22
Beef and veal	−0.84	0.4	0.15	1.25	−2.74	2.36
Fresh Pork	−0.67	−0.26	0.36	2.17	−2.97	1.67
Lamb and goat	−2.65	−0.55	−0.88	1.74	4.58	−3.32
Poultry	2.95	−1.15	0.16	−1.14	−4.96	5.01
Processed Pork	0.27	−0.7	0.21	−0.08	−0.0	−0.26
Fish	0.1	−0.42	0.08	0.14	−0.07	−0.57

more budget to food consumption, specially in rural areas. However, except for poultry, price decreases will not encourage consumption and price strategies will not be enough to increase meat and fish consumption. Marketing managers should focus on sociodemographic characteristics of households, diversify meat and fish products and offer them in a different way to different sociodemographic segments.

5. Concluding remarks

The main conclusion is that meat consumption patterns in urban and rural areas are not really different as regards economic factors (food expenditure and price). Some small income and price effect differences have been found, specially for fresh pork and fish. Fresh pork consumption responses to changes in income and price are higher in rural areas. This can be explained because consumers' preferences for fresh pork are higher in rural than in urban areas (Mili et al., 1996). On the other hand, expenditure and own-price fish elasticities are higher in urban areas. Fish consumption has been traditionally higher in urban areas because distribution channels made fish products easily available in large towns and therefore consumers have already developed the habit of buying them. Then, as economic conditions improve, they are willing to increase fish consumption.

Quality effects are very small, less than 10%, except for fish, and no differences between urban and rural areas have been found. As income grows, consumers do not tend to buy higher quality items within the analyzed meat category even in urban areas, contrary to previous expectations.

If both rural and urban households had an additional member over 26, the consumption of beef, lamb and fish would increase but at a higher level in rural households for beef and lamb. However, fish consumption rise is similar in both areas. According to age structure, no more differences have been found. If the number of males in the household increased, pork (fresh and processed) consumption would increase in both areas but the increase would be higher in rural areas. Males are not much concerned about healthy diets as they consume more pork. The level of education is only statistically significant in explaining beef, fresh pork and fish consumption, in both areas, and poultry in urban areas.

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