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Quantifying the Excess Carbon Footprint and Its Main Determinants of Spanish Households

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Abstract

New evidence is provided on the determinants of the Carbon Footprint (CF) at the household level, using the Spanish case as an example and data from the Household Budget Survey and the E-MRIO database. The research presents two new contributions. On the one hand, the basis of analysis on what we call "Excess per capita CF", i.e., the part of CF that exceeds a threshold associated with a minimum per capita consumption of each product in a household, below which level it is difficult to expect reductions in consumption. Secondly, the use of a Quantile Regression (QR) approach for the estimation of the drivers of CF. Both issues imply important changes in the consideration of the influence of some drivers considered so far in the literature, related to which CF quantile the household is in. These differences between an OLS and the QR are especially significant for variables such as income, household size, occupation, age, household composition, housing area and area of residence.

KEYWORDS: HOUSEHOLD CONSUMPTION, CARBON FOOTPRINT, QUANTILE REGRESSION, UNBIASED ELASTICITY ESTIMATES; GHG EMISSIONS

1. Introduction

The proposal of this research is to quantify the carbon footprint (CF) and its main determinants derived from the consumption patterns of Spanish households.

Several recent studies have estimated the effects of different socio-economic variables as key determinants on the CF of households produced, directly or indirectly, by their different consumption patterns, which have come to be referred to as demand-side solutions (see Salo et al.¹). Also in the recent study of Ganglmair-Wooliscroft and Wooliscroft² the authors highlight the importance of consumption, typically estimated to account for 60-70% of total

CF (Dubois et al.³). Therefore, it seems particularly relevant to focus the FC's analysis on this magnitude.

As in Creutzig et al.⁴, Beylot et al.⁵, Christis et al.⁶, or Salo et al.¹, we focus our research in analysing what they called “demand-side solutions” which, in this case, means the examination of CF from the household consumption side.

Identifying the consumption patterns behind the CF of families have been studied in a wide extent of the literature (see some recent reviews in Shittu⁷ and Druckman and Jackson⁸). In this case we use the most recent available data on consumption habits in Spain using a sample of 23,000 households (Household Budget Survey - HBS - 2018); it is, therefore, a case study specific in time and geographical scope but, despite this, useful for decision making in the short and medium term. Such case studies are very frequent in the literature (Galli et al.⁹, for the case of Portugal in 2014; Beylot et al.⁵, for France 2020; Buhl et al.¹⁰, for Poland 2013; Christis et al.⁶, for Belgium in 2008 or Mach¹¹ for Czechia in 2010, Salo et al.¹, for Finland in 2019). However, this article presents, however, two original aspects compared to this extensive literature.

Firstly, “excess household CF” is analysed instead of total CF. Excess CF is understood as that part of the CF that exceeds a threshold associated with the minimum per-capita consumption of each product. In this way, we can analyse the CF determinants associated with the part of the consumption that could be eventually reduced, in turn, cutting down on the associated pollution. As shown below, many households are very close to this minimum consumption threshold and therefore any scope for reducing their CF is limited.

Secondly, our study considers that the determinants of the carbon footprint depend to a large extent on the level of that CF. Thus, instead of using a standard analysis centred on the mean (Ordinary Least Squares Regression estimation - OLS) we propose a Quantile Regression (QR) estimation, exploring the differences in the main drivers related with a higher or lower CF for each one of its deciles.

The OLS regression, usually employed in previous literature, is not ideal to deal with phenomena such as the one we are investigating in which neither discontinuity, nor normality nor homoscedasticity can be guaranteed. Some other more technical issues, which are explained in the methodology section, make this QR chosen regression procedure the ideal one (see also de Arce and Mahia¹² for more details on the advantages of using Quantile Regression).

As common in the literature, the effect of different variables in the CF have been analysed. Among them, the first one will be household income (Vita et al.¹³, Buhl et al.¹⁰; Dutta and Gupta¹⁴; Duarte et al.¹⁵; Rakic and Rakic¹⁶; Zhang et al.¹⁷, among others). As noted in Shittu⁷, there is no clear sign in the influence of this variable on pollution produced as a function of disposable income. The empirical evidence shows that the wide degree of heterogeneity in the type of consumption produces notable differences in the estimated footprint, which

must be specifically considered, redounding in our approach of the need to study different CF patterns depending on the level of consumption.

The remaining determinants commonly cited in the literature, such as socio-economic characteristics of the household (Minx et al.¹⁸), awareness of ecological issues (Al-Marri et al.¹⁹; Herrmann et al.²⁰; Longo et al.²¹, Druckman and Jackson⁸, Moser and Kleinhüchelkotten²²), urban/rural environment implications (Tomas et al.²³, Creutzig et al.⁴, Jalas and Juntunen²⁴) or those related to population density (Gill and Moeller²⁵; Ottelin et al.²⁶; Wiedenhofer et al.²⁷), show erratic behaviour in terms of their positive or negative influence. This behaviour is a new element indicating the need to consider different consumer profiles and multivariate analysis as a key element to identify the importance of certain drivers in the polluting pattern of subjects.

Other variables such as the type of household equipment (both in qualitative and quantitative terms) would be desirable information to improve our specification of the determinants of CF (see Cai et al.²⁸ and Pothitou et al.²⁹). These authors demonstrate the clear relationship between CF and, on the one hand, the quality of available devices (beneficial effect) and, on the other hand, the quantity of devices used simultaneously in the household (negative effect). Unfortunately, this information is not available in the Household Budget Survey (HBS) which will be our main statistical source on the consumption of Spanish households.

HBS and E-MRIO datasets are available for more than 150 countries worldwide. Therefore, the methodological approach carried out in this research can be used across a vast set of regions/countries, allowing for a more accurate and comparable estimation of CF drivers, avoiding the bias of not considering differences related to preliminary lower/greater "excess family CF" as shown in this research. The main difficulty for its use lies in the correct matching between the products/services in both databases since, on some occasions, the quantity of products/services collected in each of the sources can be very unequal. In any case, the method of Cazcarro et al.³⁰ can partially overcome this drawback.

The remainder of this article is organised as follows. Section two specifies the analysis methodology followed and the data used for the analysis. Section three describes (i) the main findings on the carbon footprint of Spanish households and (ii) the most important drivers for each of them. In section four, these results are discussed. Finally, section five shows some brief conclusions.

2. Data and Methodology

The main objective of this study is to highlight the different determinants of the per capita carbon footprint of households according to the different CF deciles in which they are included. For this purpose, the following logic of analysis is followed:

- a) Estimation of the direct and indirect household carbon footprint per capita, using the Input Output methodology and the Leontief price model.

- b) Calculation of the “excess carbon footprint” per capita.
- c) Analysis of the main drivers that determine the Excess of Carbon footprint per capita, using quantile regressions.

2.1. Direct and indirect Household per capita Carbon Footprint estimation by using E-MRIO system and Leontief Prices Model

In this research, the Leontief pricing model is used to derive the kilograms of CO2 emissions per Euro consumed for each product, measured from the EDGAR indicator - Emissions Database for Global Atmospheric Research -, collected in the E-MRIO database (Lenzen et al.³¹ and Kanemoto et al.³²).

The use of the CO2 EDGAR indicator follows the recommendations of the Intergovernmental Panel on Climate Change (IPCC-2014) where CF was considered the most important and urgent climate change threat (even though it is known the negative side effects of reducing CO2 in terms of increasing other pollutants).

E-MRIO database provides an estimation of each industry CO2 footprint, incorporating both the intermediate consumption of the economy and that resulting from imports from different countries. The original E-MRIO framework presents commodities-industries information. For the conversion to the traditional industries-industries input-output framework, a common attribution technique has been employed using the origin and destination coefficient matrices as follows:

1. Starting from the origin ($C_{comm \times ind}$) and destination ($D_{comm \times ind}$) matrices (commodities in rows and industries in columns), the coefficient matrices are calculated using their inner cells C_{ij} .

$$Origins\ Coef \rightarrow C_{comm \times ind} = \frac{C_{ij}}{\sum C_i} \quad (1)$$

$$Destinations \rightarrow D_{comm \times ind} \quad (2)$$

To achieve the IO (industries x industries) framework, the following matrix product is performed:

$$IO \rightarrow C'D \rightarrow (ind \times comm) \times (comm \times ind) \rightarrow ind \times ind \quad (3)$$

2. From the input-output framework, the well-known Leontief price model is applied to derive the total effect associated to an increase in demand

$$(I - A)^{-1}FD = P \quad (4)$$

where A is the so-called technical coefficient matrix, FD the final demand matrix and P the final production matrix.

In this way, we can then compute the direct and indirect chain effects after a unit increase in final demand of each product, considering the industrial structure of the country (national and imported) and the intermediate consumption among different industries.

Once the total increase in production associated with the final demand for each product is known, we can estimate the CO₂ emissions (using EDGAR indicator of CO₂ emissions) per euro of expenditure through the “environmental extension” built into the E-MRIO system.

3. In the next stage, we linked the 119 CPA products considered in E-MRIO dataset to the 316, 5 digits ECOICOP categories available in the Spanish Household Budget Survey. The Spanish HBS 2018 has been used as primary data source. This survey contains data for a geographically representative sample of 23,116 households for Spain as a whole (5-digit product detail) and at the level of the 19 regions (4-digit product detail).

As pointed out in Cazcarro et al.³⁰, “Consumption data is usually available in classifications of expenditure according to purpose such as ECOICOP (Classification of Individual Consumption by Purpose). However, multisectoral multi-industry models follow a classification of products aligned with an industry classification such as CPA (Classification of Products by Activity, Eurostat, 2019a). Thus, it is necessary to bridge both. In this article, authors refer to conversion from ECOICOP to CPA products, focusing the model process on Input Output structures (IO) or Computable General Equilibrium (CGE) proposals. In our case, we followed the exact opposite path: from CPA to ECOICOP data.

4. Once CPA and ECOICOP products have been conveniently paired, the next step was to compute the family CO₂ emissions considering the expenditure of each household in the different products. As an intermediate step, the corresponding Consumer Price Index (CPI) supplied by the Spanish Statistics Institute (INE) have been used to update the values of the 2018 current prices of the Household Budget Survey to the current values of the E-MRIO tables available for Spain (2015).

2.2. Excess of Carbon footprint Per capita (EXPCW)

As mentioned before, the variable of interest in our study is the household CF per capita exceeding what could be considered the minimum emission for each household. In this sense, we calculated (by difference) the value of the footprint that exceeds the 60% of the median value for the overall distribution observed for the total expenditure of the Spanish household population.

Given the large differences in purchasing parity power between regions in Spain, and the fact that the HBS refers to the value in euros of purchases and not to quantities, the calculation of the minimum threshold above was carried out in a differentiated manner for each of the 19 Spanish Regions (Autonomous Communities).

$$Threshold_j = median(CFPC_{ij}) \times 0.6 \quad (5)$$

$$EXPCW_{ij} = CFPC_{ij} - Threshold_j \quad (6)$$

Where “j” refers to the region and “i” to the particular observation (family).

The decision to use this variable as the target of the analysis is in line with the most used definition of minimum consumption, which is set at 60% of the median (50%), generally accepted in the literature (Atkinson et al.⁴²). Of course, the resulting 30% threshold could be varied, but it can also be considered as a comparable frame of reference (Hagenaars and Zaidi³³).

2.3. Quantile Regression for Excess of carbon footprint per capita drivers

In the context of the analysis carried out in this research, Shittu⁷ points that most of the previous studies have focused on a categorisation of households either based on family income or on the comparison between households (see Duarte et al.¹⁵, Lopez et al.³⁴ or Zhang et al.¹⁷). Additionally, also most of them have used OLS regression (as in Mach et al.¹¹) or simple descriptive bivariate analyses, such (as in Christis⁶).

In this research we use Quantile Regression as the proper technique to carry on the analysis. There are, at least four key elements that make this technique the most appropriate for our case: (i) the likely existence discontinuities between CO2 emissions and explanatory variables, (ii) the presence of outliers that may distort the results of a plain OLS regression, (iii) the expected presence of heteroscedasticity in the residuals, and (iv) the non-normal distributions.

The main advantage of Quantile regression is to provide a different estimate of the coefficients for each one of the different quantiles considered for the dependent variable. If we want to corroborate (or reject) that the importance of the independent variables for CF is not homogeneous, Quantile Regression emerges as natural appropriate technique.

Quantile Regression estimator is based also in minimization of errors as the OLS does, but it considers the median (or another selected quantile) instead differences with the average.

$$|e_i| = \sum_i |y_i - median| \quad (7)$$

In the above equation, the equal weight of both the left and right sides of the endogenous variable derives an accurate estimate of the median. Therefore, by weighting each tail of the distribution by the desired quantile and minimizing the previous function, we can estimate the specific coefficients for any other quantile (called τ):

$$Quantile(\tau) = \sum_i \rho_\tau |y_i - q| \quad (8)$$

where (ρ_τ) is:

$$\rho_\tau(x) = \begin{cases} -x \cdot (1 - \tau) & x < 0 \\ x \cdot \tau & x \geq 0 \end{cases} \quad (9)$$

In OLS regression, the estimated value of the endogenous variables corresponds to the expectancy of the mean given the set of variables and the explanatory parameters-variables $X\beta$:

$$\hat{y} = \mu = E(y|X\hat{\beta}) \quad (10)$$

What is equivalent to:

$$\hat{y} = q = quant(y|X\hat{\beta}_\tau) \quad (11)$$

Then, the coefficients for each quantile can be estimated by using the following equation:

$$\min \sum_i \rho_\tau |y_i - X\hat{\beta}_\tau| \quad (12)$$

Rewriting the previous equation, we have:

$$\min \left\{ \sum_{y_i \geq X_i \hat{\beta}} \rho_\tau |y_i - X\hat{\beta}_\tau| + \sum_{y_i < X_i \hat{\beta}} (1 - \rho_\tau) |y_i - X\hat{\beta}_\tau| \right\} \quad (13)$$

Therefore, Quantile Regression procedure uses a different weight for positive and negative errors, producing different coefficients for each percentile/quantile.

As commented above, another additional advantage of this estimation method is that it avoids the so-called “Heckman selection bias”. As demonstrated by this author, the commonly used sample trimming produces biased parameters, and invalidates their later applicability. In the quantile regression, the total sample is always used, although conveniently weighted, and then, non-biased estimates are obtained.

For the coefficient covariance matrices and standard errors estimates, we have used direct method under i.i.d. error assumption and Bofinger bandwidth specification (see Koenker³⁵ for an overview).

3. Results and discussion.

3.1. Direct and Indirect family carbon footprint per capita

Table 1 shows a simple descriptive of the variable analysed (EXPCW) i.e., excess pollution per capita (in Kg). The calculations show the total pollution and by type of product as well as, in each case, the overall mean pollution and the mean for each decile.

		Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10
Excess PC per Type of Product and Total	Global Mean	<= 502.94	502.95 - 783.98	783.99 - 1035.45	1035.46 - 1278.25	1278.26 - 1537.48	1537.49 - 1837.77	1837.78 - 2219.39	2219.40 - 2753.37	2753.38 - 3638.79	3638.80+
Food and non-alcoholic beverages	190.36	64.31	108.49	130.49	155.46	168.76	193.92	217.19	243.58	270.21	351.14
Alcoholic beverages and tobacco	24.31	10.12	14.88	17.14	18.38	22.19	24.51	27.04	28.71	32.96	47.17
Clothing and footwear	63.68	20.49	31.77	40.28	46.30	52.47	60.08	68.42	78.98	99.76	138.25
Housing, water, electricity, gas, and other fuels	826.02	11.97	205.89	343.52	463.03	604.04	713.96	906.48	1141.41	1510.92	2358.71
Furnishings, household equipment and routine household maintenance	67.97	13.27	23.84	31.36	40.84	46.49	58.77	71.94	88.18	112.53	192.44
Health	44.75	9.70	18.42	25.36	31.63	34.46	40.84	50.90	60.54	74.38	101.25
Transport	336.08	65.56	114.85	147.14	186.42	217.46	268.64	323.24	392.22	517.75	1127.41
Communication	33.17	6.68	16.76	20.58	24.16	27.35	32.42	37.59	42.96	50.91	72.29
Recreation and culture	76.52	16.74	31.22	40.52	46.96	57.63	68.81	79.74	93.69	118.51	211.33
Restaurants and hotels	120.43	15.35	43.88	60.90	74.29	93.13	116.29	129.50	156.44	195.25	319.22
Miscellaneous goods and services	94.38	12.09	31.69	44.42	56.70	67.63	82.79	94.66	119.52	157.20	277.05
Excess PC TOTAL Family Waste	1890.41	250.20	650.72	912.72	1157.08	1404.33	1679.66	2019.88	2460.12	3155.44	5213.37

Table 1.- Per Capita Excess of CF (Kg) Total and detail by decile and type of product

The mean of the total EXPCW variable is around 1,900 kg of CO₂, which implies an excess of household pollution close to 4,700 kg of CO₂ per year and per household considering an average household size of 2.48 members. However, the distribution of this variable shows a very marked asymmetry. As shown in Fig. 1, some 20% of Spanish households have per capita pollution excesses of more than 2,750 kg (45% higher than the average) and 10% of

households more than 3,630 kg (almost double the average excess). At the other extreme, almost a third of Spanish households pollute well below the average (pollution excess of less than 1,040 kg, 45% below the global average). The non-normality visible in this Fig. 1 has been corroborated by the Kolmogorov-Smirnov test. This fact supports the suitability of using QR.

Table 1 also shows important differences in the deciles corresponding to some product categories. These differences are more marked in the case of those products whose consumption may be very different depending on various characteristics of the household analysed and whose pollution footprint may, in turn, be very dissimilar. The most characteristic case is that related to “Housing, water, electricity, gas and other fuels”, whose CF can vary greatly depending on certain characteristics of the observed household. For example, heating a residence requires an extraordinarily different expenditure and impact in terms of CF depending on the climatic conditions of the area, the size of the house or the type of fuel used. Something similar can be said about transportation costs and CF, where variables such as type of habitat, distance, type of transportation and fuel used, etc., will mark notable differences between deciles.

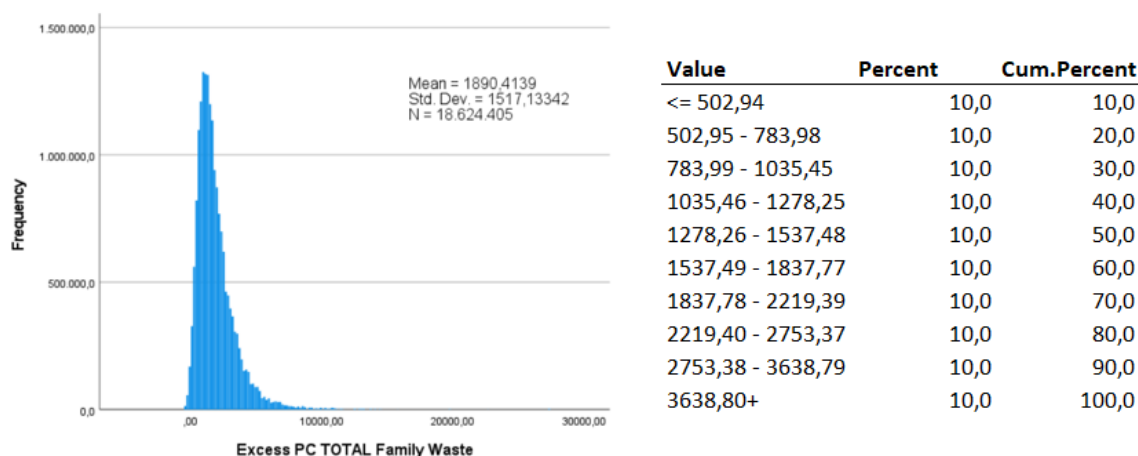


Fig. 1 - Distribution of Excess CF Per Capita Household (EXPCW)

For this reason, and because of the technical advantages mentioned in section 2 of this article, a quantile approach seems ideal when analysing the determinants of a greater or lesser excess of contamination. This approach distinguishes in a particular way the families located at the extremes of this distribution, which is particularly interesting is to understand determinants associated with behaviour of families with a higher level of pollution. Calculating the total excess pollution per household, the Pareto like diagram (Fig.2) shows that, in effect, 10% of Spanish households are responsible for 25% of the overall excess pollution.

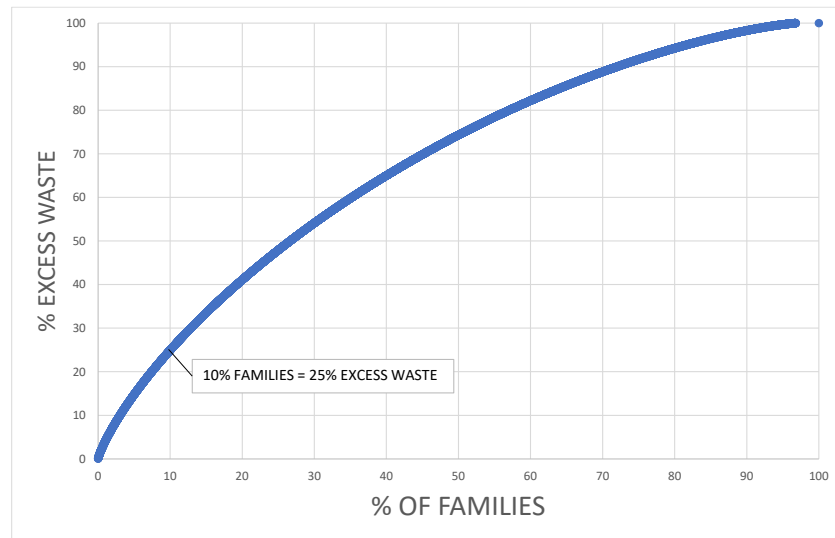


Fig. 2 - Pareto Diagram. Excess CF per Family

3.2. Estimate of coefficients for each determinant of different patterns in the Excess of CF per capita

This section compares the results obtained in an OLS regression with those corresponding to the quantile approximation. For both exercises we have used a sample of more than 20,000 households representative of a universe of about 18 million Spanish households. The dependent variable used in both regressions measures the excess household pollution per capita (EXPCW) calculated as described in section 2.2.

The following table (table 1) shows and compares the coefficients significant at 95% confidence for both the overall regression and those corresponding to each of the quantiles. The results have been organised according to the type of explanatory variable, distinguishing between characteristics of the main breadwinner, characteristics of the household, characteristics of the dwelling and characteristics of the geographical area in which it is located. The variables/blocks chosen for the analysis correspond to those commonly used in the recent literature (see summary table in the annex I, Shittu⁷ or Druckman and Jackson⁸).

The column labelled “GLOBAL” shows the significant coefficients ($p < 0.05$) obtained in the OLS regression after a process of selection of characteristics and examination of the different candidate explanatory variables. The columns labelled Q=0.1 to Q=0.9 show the coefficients of the same variables obtained in the quantile regression (provided they are significant at 95%).

VARIABLES IN THE REGRESSION Personal Characteristics (Household Head)	OLS REGRESSION	QUANTILE REGRESSIONS								
		Q=0.1	Q=0.2	Q=0.3	Q=0.4	Q=0.5	Q=0.6	Q=0.7	Q=0.8	Q=0.9
AGE	27.38	22.46	24.49	22.95	24.88	26.24	26.15	27.02	20.37	21.28
AGE SQUARED	-0.24	-0.18	-0.20	-0.19	-0.21	-0.22	-0.22	-0.23	-0.19	-0.20
OCCUPATION = (Never have worked)	-	-	92.14	89.51	-	-	-	102.12	-	-
OCCUPATION =Managers	375.27	115.92	159.65	173.98	229.13	275.77	343.61	381.72	473.10	571.42
OCCUPATION =Technicians and professionals	144.45	81.20	117.54	114.12	114.67	124.67	139.16	174.05	189.04	218.99
OCCUPATION =Clerical-type and service and trade employees	84.01	40.19	69.88	55.67	48.22	63.02	92.83	91.19	105.62	-
OCCUPATION =Craftsmen and low skilled workers	94.31	68.10	67.36	57.50	61.31	65.33	79.05	82.63	89.65	-
<i>OCCUPATION_Reference=Non skilled workers</i>										
EDUCATION =Cannot read or write or went to school for less than 5 years	-347.01	-	-241.57	-299.81	-387.19	-371.11	-441.93	-381.96	-401.76	-345.09
EDUCATION =Primary education or attended school for at least 5 years	-352.65	-160.18	-250.76	-285.36	-359.86	-357.05	-434.59	-346.02	-340.77	-309.50
EDUCATION =Secondary education or lower secondary education	-222.96	-	-169.75	-191.07	-249.63	-252.21	-325.53	-255.11	-253.45	-
EDUCATION =High School, Vocational Training (Intermediate and Basic)	-173.72	-	-120.35	-144.92	-205.15	-209.45	-274.07	-211.56	-214.87	-
EDUCATION =Advanced vocational training	-171.87	-	-121.69	-143.14	-195.93	-204.35	-277.46	-212.80	-208.03	-
EDUCATION =Undergraduate Degree	-	-	-108.18	-	-140.35	-150.30	-209.16	-	-	-
EDUCATION =Bachelor's Degree	-	-	-	-113.71	-183.98	-187.39	-266.54	-198.26	-	-
<i>EDUCATION_Reference=Post Graduate education</i>										
COUNTRY OF BIRTH=Rest of European Union (EU 27)	-	-	-	-	-	-	-	-	-	-
COUNTRY OF BIRTH=Rest of Europe	-	-293.21	-195.70	-	-	-	-	-	-	-
COUNTRY OF BIRTH=Rest of the World	-	-80.80	-68.98	-	-	-	-	-	-	-
<i>COUNTRY OF BIRTH_Reference=Spain</i>										
Household & Family Characteristics		Q=0.1	Q=0.2	Q=0.3	Q=0.4	Q=0.5	Q=0.6	Q=0.7	Q=0.8	Q=0.9
HOUSEHOLD SIZE=Equivalent OECD scale	-1717.93	-799.54	-901.19	-1029.01	-1102.90	-1248.44	-1483.24	-1766.77	-2142.66	-2641.59
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	299.24	121.75	156.64	175.45	205.89	243.05	284.76	329.55	395.96	474.86
FAMILY WEALTH: Log INCOME (Exact amount of net monthly income of the main breadwinner)	687.53	392.20	448.92	481.31	510.07	540.78	566.71	615.76	656.93	697.67
FAMILY WEALTH= Other homes available	733.74	428.77	476.66	517.44	569.62	603.71	669.00	753.14	829.81	916.49
FAMILY HABITS = Total number of lunches and dinners	2.76	1.33	1.43	1.22	1.48	1.57	1.25	1.59	1.17	1.56
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	124.36	138.80	127.13	129.54	125.47	150.08	119.76	140.12	112.37	158.13
HOUSEHOLD TYPE=Other households with one person or couple without children	127.88	110.84	123.31	131.23	115.76	125.45	143.89	171.29	169.78	330.50
HOUSEHOLD TYPE= Couple with children under 16 years old or adult with children under 16 yo	-141.08	-50.85	-	-91.05	-96.00	-85.96	-123.64	-128.90	-159.54	-173.59
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	-414.34	-248.69	-318.08	-303.97	-360.34	-415.60	-388.90	-389.20	-429.43	-446.02
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	-450.31	-253.73	-334.02	-325.77	-403.53	-457.41	-430.90	-438.45	-455.87	-469.93
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	-472.02	-213.07	-301.74	-313.84	-410.68	-467.10	-470.17	-455.91	-500.91	-511.34
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	-531.86	-213.04	-318.28	-328.29	-428.67	-487.72	-505.57	-513.03	-526.17	-525.14
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	-634.39	-254.46	-373.11	-389.33	-491.89	-561.82	-580.59	-587.30	-631.53	-674.04
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	-693.72	-302.63	-414.10	-429.72	-537.65	-630.42	-642.10	-655.43	-702.44	-712.20
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	-781.70	-360.24	-479.13	-497.68	-616.78	-701.52	-719.60	-731.80	-754.43	-802.75
HOUSEHOLD COMPOSITION=Number of dependent children	-	30.67	26.77	-	-	-	-	-	-	-

House and Building Characteristics		Q=0.1	Q=0.2	Q=0.3	Q=0.4	Q=0.5	Q=0.6	Q=0.7	Q=0.8	Q=0.9
HOUSING= Log Area	599,91	351,21	359,28	383,56	387,75	427,51	475,57	506,05	586,73	671,17
BUILDING TYPE= Detached single-family house	-	532,09	243,29	-	-	-	-	-	-	-
BUILDING TYPE= Semi-detached or semi-detached house	-	483,55	-	-	-	-	-	-	-	-
BUILDING TYPE= Building with more than one dwelling	-	485,31	-	-	-	-	-	-	-	-
BUILDING TYPE= Building with less than 10 dwellings	-	483,84	-	-	-	-	-	-	-	-
<i>BUILDING TYPE_Reference= Building with more than 10 dwellings</i>										
HOUSING= Number of rooms	27,52	15,60	18,58	19,65	22,79	27,45	27,50	22,69	22,84	35,78
TYPE OF HEATING= Electricity	206,94	125,67	120,82	130,20	140,06	172,76	191,51	198,91	213,88	254,63
TYPE OF HEATING= Natural Gas	250,80	111,56	129,22	153,59	177,20	208,39	231,08	268,30	290,59	314,53
TYPE OF HEATING= LPG	348,74	122,58	214,18	277,37	291,44	301,38	333,01	397,63	373,73	495,58
TYPE OF HEATING= Other liquid fuels	162,74	116,02	159,93	163,89	192,88	189,37	160,41	150,28	172,08	153,25
TYPE OF HEATING= Solid Fuels	-	-	-	-	-	-	-	-	-	-
TYPE OF HEATING= Other liquid fuels	-	-	-	-	-	-	-	-	-	-
<i>TYPE OF HEATING_Reference=NO Heating</i>										
HOT WATER SYSTEM= Electricity	-	-	-	-	-	-	-	-	-	-
HOT WATER SYSTEM= LPG	-111,32	-105,83	-116,63	-122,68	-113,50	-101,59	-80,20	-	-	-
HOT WATER SYSTEM= Other liquid fuels	-	-	-	-	-	-	-	122,77	142,43	194,30
HOT WATER SYSTEM= Solid Fuels	-	-	-176,46	-247,29	-218,85	-164,48	-182,12	-	-	-
HOT WATER SYSTEM= Other	-	-	-	-	-111,82	-	-	-	-	-
<i>HOT WATER SYSTEM_Reference=NO Hot water system</i>										
Area Characteristics		Q=0.1	Q=0.2	Q=0.3	Q=0.4	Q=0.5	Q=0.6	Q=0.7	Q=0.8	Q=0.9
AREA OF RESIDENCE= Urban luxury	587,86	169,07	148,49	207,89	362,01	497,62	565,82	745,81	743,06	1396,56
AREA OF RESIDENCE= Urban high	171,21	-	44,49	70,71	97,20	96,76	114,39	135,64	138,80	251,90
AREA OF RESIDENCE= Rural agrarian	-	-	-	-	-	-	-	-	-	-
<i>AREA OF RESIDENCE_Reference=Other</i>										
REGION=NORTHWEST	-182,02	-96,60	-102,19	-119,90	-146,06	-174,73	-178,40	-176,42	-161,56	-
REGION=NORTHEAST	-117,78	-	-44,01	-51,74	-80,31	-104,71	-104,53	-113,65	-127,92	-
REGION=CENTRAL	-166,14	-65,11	-53,82	-61,31	-84,77	-121,99	-124,09	-143,92	-165,91	-135,04
REGION=EAST	-	-	-	-	-	-54,97	-	-	-	-
REGION=SOUTH	-	-	-	-	-	-	-	-	-	135,67
REGION=CANARY ISLANDS	-99,06	-	-61,88	-	-	-	-	-	-120,17	-
<i>REGION_Reference=MADRID</i>										
POPULATION SIZE= 100,000 inhabitants or more	-94,88	-	-	-	-	-80,31	-	-95,19	-107,93	-199,69
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants	-	-	-	-	-	-	-	-	-	-
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants	-56,96	-	-	-	-	-	-	-	-	-
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants	-	-	-	-	-	-	-	-	-	-
<i>POPULATION SIZE_Reference=Less than 10.000 inhabitants</i>										
POPULATION DENSITY= Densely populated area	-	-	-	-	-	-	-	-	-	-
POPULATION DENSITY= Area with intermediate population density	-	-	-	-	-	-	-	-92,39	-111,47	-108,00
<i>POPULATION DENSITY_Reference=Sparsely populated area</i>										

Table 2. Regression Estimates (Coefs. with p value<0.05). Global Estimation and Quantile Estimations

Detailed standard errors and significance values provided in annex II; In red coefficients that are statistically different from those obtained in the overall regression.

As can be seen, the OLS regression (global) offers averaged coefficients which, although interesting for explaining the average excess pollution per capita, do not allow us to understand the differential behaviour of the families located in the different quantiles of this excess pollution.

In annex III, the results of some robustness tests are shown. On the one hand, the results of the Stata "checkrob" test (Barslund³⁶) are summarized. In addition, a comparative table of the change in the regression coefficients as more variables are progressively added is included. The results indicate robustness in terms of signs and significance for the most relevant variables. Some of the parameters are modified by progressively introducing covariates in the regression, which we must interpret as a necessary correction associated with avoiding the bias linked to the omission of relevant variables. Given that it might not be possible to control for all factors (there might be some other relevant unobservable or unavailable variables that are not included in the regression) there will always be some concern about the bias from omitted variables.

Personal Characteristics

Unlike other studies such as that of Salo et al.¹, which found no significant effect of the age of the main breadwinner except for very high values of age, here we have included this variable in a non-linear way (with its level and squared value), with both coefficients being significant and showing a direct relationship. As shown in Fig. 3, Excess pollution increases non-linearly with age until the age of 58/59, at which point the relationship begins to grow at an increasingly slower rate. This relationship is significant for all quantiles, although the intensity of the coefficient varies significantly. In fact, the quantiles with the highest excess contamination (0.8 and 0.9) show the lowest sensitivity to the change in the age of the main breadwinner.

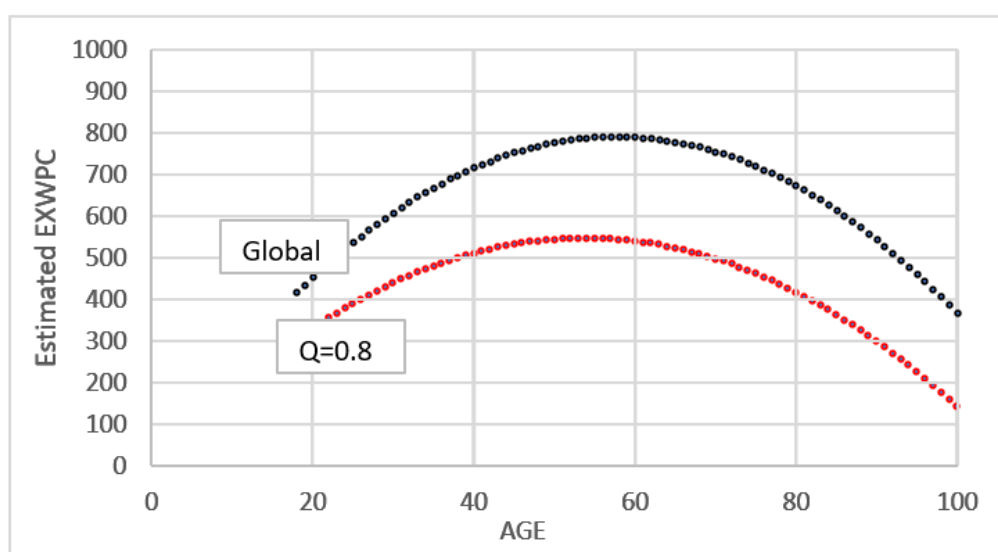


Fig. 3 – Partial Effect of Age in EXPCW (Comparison of Global Regression Coefficient Vs Q=0.8)

As in Salo et al.¹, the educational level of the main breadwinner is one of the most relevant variables in explaining excess household pollution per capita. It should be noted that the effect of educational attainment is not associated with income level, which is already controlled for by the inclusion of family income in the regression. In general terms, the educational level and the coefficients of the overall regression reveal very consistently that the lower the level of education, the lower the excess pollution, as already pointed out by Longo et al.²¹. For example, when the breadwinner has not attained elementary education or has only completed education the per capita excess pollution is around 350 kg lower than at the highest educational level, i.e., 20% below the overall average. This effect is apparently more relevant the higher the quantile of excess pollution; however, considering the dispersion of the coefficients, these differences are not sufficiently relevant to be taken as significant (except for the quantile of lowest excess pollution, $Q=0.1$).

In line with the findings of Gough et al.³⁷ for the UK, an analogous result is obtained when analysing the relationship between excess pollution and the level of main breadwinner occupation. The relationship is consistent as one moves up the skill scale; the most skilled occupations (directors and managers) are associated with per capita excess pollution of about 375Kg (20% of the overall average) relative to the reference category (non-skilled workers); technicians and professional also have almost 8% more excess pollution. The comparison of coefficients for the different quantile regressions indicates that, in general, the effect of skill level is higher the higher the quantile. The Fig. 4 compares the coefficient of the highest skill level (managers) on EXWCP. For the least polluting quantiles ($Q=0.1$ – 0.4) the positive effect is statistically smaller than that obtained with the ordinary regression for the full sample and the opposite is true for the higher pollution quantiles.

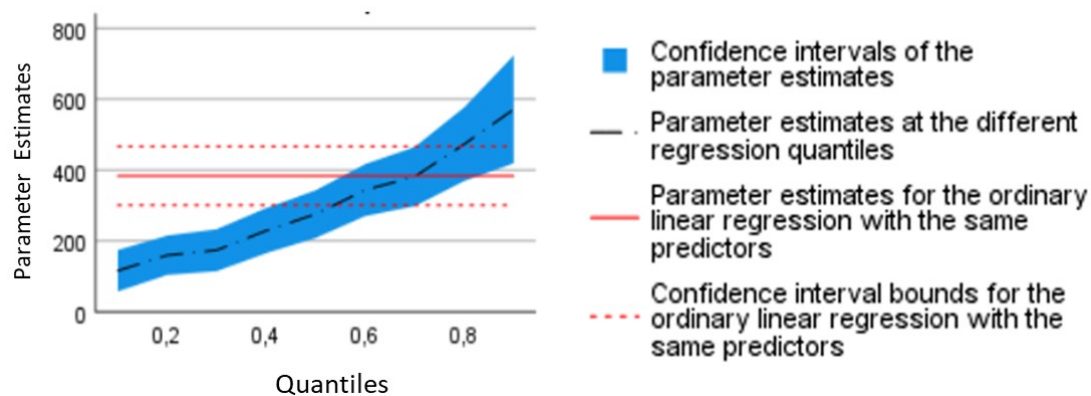


Fig. 4 –Effect of Occupation Level = Managers in EXPCW (Global estimate Vs Quantile Estimations)

Indeed, the following table shows how the average prediction of the effect of different skill levels on excess pollution is significantly different when examined for the different quantiles. The comparison of the two extreme skill levels (Managers Vs Non-Skilled

Workers) implies pollution increases of 15% for the quantile Q=0.1, significantly lower than the 21% observed for the highest pollution quantile (Q=0.9).

OCCUPATION	q=0,1	q=0,9
OCCUPATION =Managers	881,4	3234,0
OCCUPATION =Technicians and professionals	846,7	2881,6
OCCUPATION =Clerical-type and service and trade employees	805,7	2749,7
OCCUPATION =Craftsmen and low skilled workers	833,6	2730,3
OCCUPATION _Reference=Non skilled workers	765,5	2662,6
Difference Managers Vs Non-Skilled Workers in %	15%	21%

Table. 3 –Estimation of impact of different Occupation Levels in EXPCW (Quantile Estimations)

In the block of household head characteristics, it is interesting to note that, using the quantile approximation, the country of birth of the main breadwinner may play a relevant role in explaining the EXPCW which, to our knowledge, has not been included in previous studies. Indeed, although the ordinary regression does not seem to capture this effect, being born in a foreign country is shown to be statistically significant for the two quantiles of lower excess pollution. This finding could suggest a higher level of environmental awareness on the part of the foreign population visible precisely in the least polluting households.

Household characteristics

Logically, and beyond the characteristics of the household analysed, the most relevant variable in explaining the EXPCW is related to whether the household has more than one dwelling at its disposal. In these cases, the coefficient of the overall regression suggests that the average per-capita pollution increases by around 730Kg of CO₂ (a 38% average value of excess pollution). This extra pollution would be associated, among other factors, with higher household maintenance costs (e.g., utilities and heating) and higher mobility demand (probably due to commuting between residences). As the Fig. 5 illustrates, the results of the quantile regression indicate that the effect of having an additional dwelling is significantly different according to the quantile of excess expenditure, growing systematically from 428 kg of CO₂ in the first quantile to 916 kg in the second quantile.

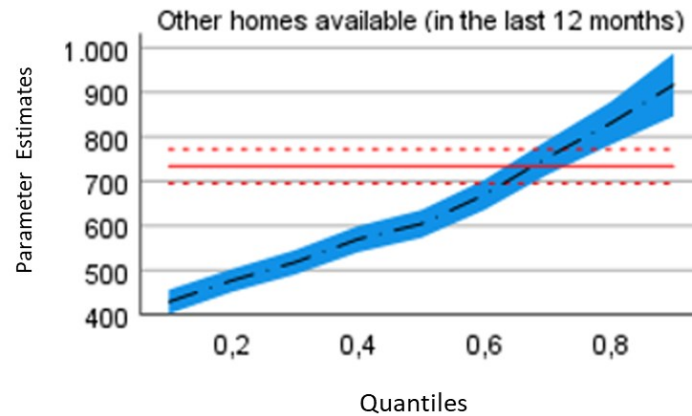


Fig. 5 –Effect of Having other homes available in EXPCW (Global estimate Vs Quantile Estimations)

These increasing impacts in gross terms are, however, decreasing in relative terms with respect to the pollution level of each quantile; in fact, an impact of 428Kg for Q=0.1 represents a significant increase in relation to the average excess pollution level for the lowest pollution decile, while an impact of 916 (Q=0.9) represents a clearly lower impact in relation to the average excess pollution level of the most polluting families. In fact, we can illustrate the differences by making an average estimate of the effect for the different quantiles; as can be seen in the following table, the estimate of the relative impact is significantly lower for the highest pollution quantiles (34%) than for the lowest pollution quantiles (51%).

	q=0.1	q=0.2	q=0.3	q=0.4	q=0.5	q=0.6	q=0.7	q=0.8	q=0.9
Other Homes Available = yes	1262	1484	1689	1903	2110	2342	2643	3010	3647
Other Homes Available = NC	834	1007	1172	1333	1507	1673	1890	2180	2730
Difference in %	51%	47%	44%	43%	40%	40%	40%	38%	34%

Table. 4 –Estimation of impact of Having other homes available in EXPCW (Quantile Estimations)

In any case, beyond the precise differences, it is interesting to highlight once again how the use of a single regression for the full sample blurs the true importance of the explanatory variables.

With respect to the number of household members, the overall regression shows a non-continuous relationship. The minimum value of per capita excess pollution is associated with households with three members. Thus, the second family member of the household reduces per capita excess pollution by about 820 kg of CO₂ (about 30% of the overall average) and the third member reduces it by a further 8% (relative to the average). However, from the fourth member onwards, the reduction is progressively less marked and becomes positive from the sixth member onwards.

The effect of family size on per capita pollution is shown very clearly and with greater relevance in the decile with the highest pollution. This might suggest that certain measures aimed at reducing pollution should consider family size.

The differences of this effect in the different quantiles, illustrated in the graph below (Fig. 6), are partially relevant. The quadratic coefficient is shown to differ from the overall coefficient in practically all quantiles and the linear coefficient in the quantiles $Q=0.1$ to $Q=0.5$ and $Q=0.9$. This implies, from a technical point of view, that the overall ordinary regression would be giving a biased picture of the importance of household size relative to the true value of the parameter in each of the quantiles. Thus, moving from a single individual to two individuals in a family with a low level of pollution would barely mean a reduction of 434 kg CO₂ per capita, while in a family located in the 0.9 quantile it would mean a reduction of 1217 kg of CO₂. It should be noted that this impact on extra pollution according to the number of members cannot be related to the need to have a larger or smaller house or more or fewer rooms since these variables have also been included in the same regression. It can therefore be assumed that the observed effects can be associated with changes in consumption patterns associated with changes in household size.

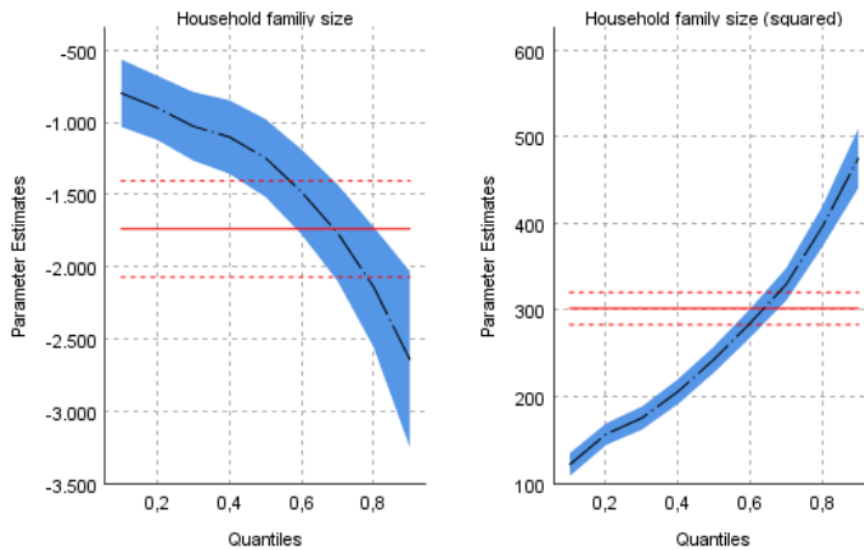


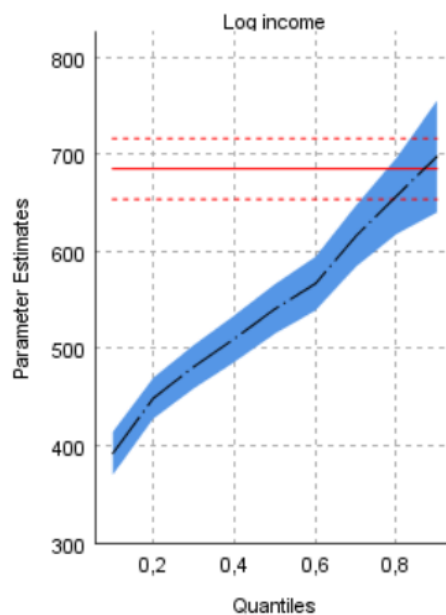
Fig. 6 –Effect of Household Members in EXPCW (Global estimate Vs Quantile Estimations)

As in Vita et al.¹³, Buhl et al.¹⁰; Dutta and Gupta¹⁴; Duarte et al.¹⁵; Rakic and Rakic¹⁶; Zhang et al.¹⁷, income is obviously a powerful explanatory factor of consumption and thus of excess per-capita household pollution (see Sitthu⁷). As in Shigetomi et al.³⁸ and in the large body of experience reviewed in Pottier³⁹, our analysis specifies, as a stylized fact in the literature, a non-linear relationship between consumption and income.

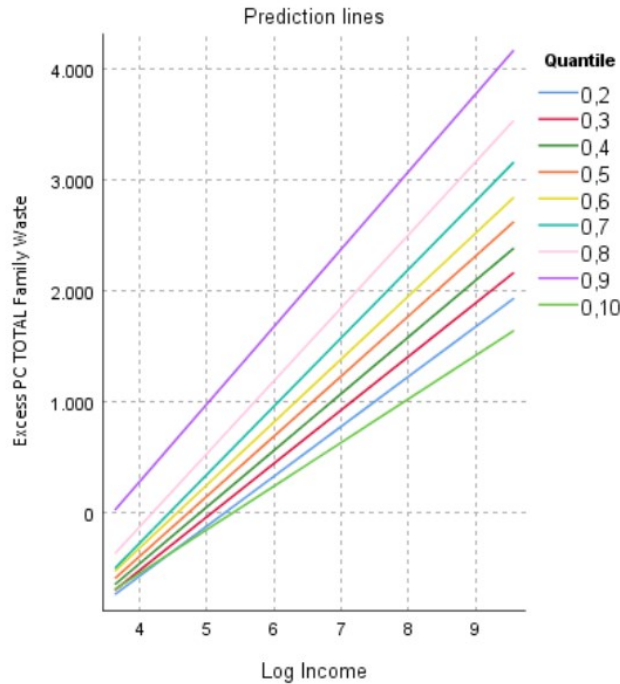
The overall OLS regression indicates that a 10% increase in income generates increases in per capita excess pollution of around 3.6%. This result would be in line with those offered by Pottier³⁹ for the Spanish case derived from his own estimation of the articles

by Duarte et al.¹⁵ and Lopez et al.³⁴. Both indicate bivariate elasticities lower than 0.41 and 0.54. In our analysis, the value would be around 0.36, but including the corresponding control variables.

However, the QR results are very revealing. Firstly, they show a progressively larger impact of income the higher the quantile of excess pollution is (see Fig.7). But even much more interestingly, the illustration suggests that the single parameter estimate in the OLS would be clearly biased upwards, being an accurate representation only for households with a higher EXPCW. The Fig. 8 shows, in effect, forecast lines with a slightly steeper slope as the level of the quantile increases.



**Fig. 7 –Effect of Log Income (Main breadwinner) in EXPCW
(Global estimate Vs Quantile Estimations)**



**Fig. 8 –Prediction of Impact of Log INCOME in EXPCW
(Global estimate Vs Quantile Estimations)**

Again, our results would coincide with those of Pottier³⁹ that confirmed notable differences between the lower quantiles (between 1.2 and 1.43) and the upper quantiles (from 0.47 to 0.65).

This relevant finding, only visible thanks to the use of QR, has enormous relevance in terms of fiscal policy aimed at reducing CF. Although the positive correlation between income and excess pollution is always true, its significance is much lower than previously suggested and also varies in a wide range (coefficients between 400 and 700 approximately) suggesting that this variable should not be the only or the main variable used to stimulate fiscal policies to reduce CF.

The effect of household composition has been examined using different explanatory variables. Among the many existing household typologies, three of them have been shown to be systematically relevant in explaining differences in excess household pollution. Single-person households or couples with one member over 65 years of age account for a slight increase in average pollution (124 KG of CO₂, 7% of the average excess pollution) and something similar occurs with individuals or couples without children. On the other hand, individuals, or couples with a child under 16 years of age show a small systematic reduction in excess pollution of a similar size. The quantile estimates do not provide, in general terms, significant differences for these coefficients when comparing the different quantiles. However, the relationship between family structure and level of contamination is somewhat more complex given that the family structure is a combination of several variables also included in the regression such as the age of the main breadwinner, the number of total household members, the

presence of family members of different age groups or the number of dependent children.

Consistent with the findings of Gough et al.³⁷ for the case of UK households, beyond the relationship between the age of the main breadwinner and excess pollution reviewed previously, it is interesting to note how, in effect, the presence of other family members in certain age brackets influences the mean per capita excess pollution. In terms of the overall regression, the presence of an adult in the household reduces excess pollution the more the older the adult is. Indeed, the reduction in excess pollution reaches 781 kg of CO₂ (40% of the overall average) if this adult is over 84 years of age and 690 kg if he/she is between 65 and 84 years of age. Although the quantile estimation shows some small differences in the estimated coefficients for these variables related to household composition, no statistically significant overall divergence is observed when compared with the global estimates. The presence of dependent children in the household is only shown to be statistically significant in the first two quantiles; in these two groups of low excess pollution, each dependent child contributes a small amount of excess pollution.

In line with the findings in Cai et al.²⁸ or Pothitou et al.²⁹, among the family habits that are shown to be statistically relevant in explaining household pollution, it is very interesting to observe the result regarding meals and dinners at home. Each lunch or dinner at home slightly increases excess pollution, but what is interesting is the result of the quantile regression that puts in value this interesting approximation. Indeed, the quantile regression shows a systematic upward estimation bias if the full sample is used: even though there are no significant differences between quantiles, the coefficient of the overall regression would be above the estimate for any quantile. In fig. 9, the red lines show the OLS coefficient (mean and Confidence Interval), compared with the QR coefficients in blue. As shown, the first one is clearly and significantly over-estimating the effect this variable on the EXPCW.

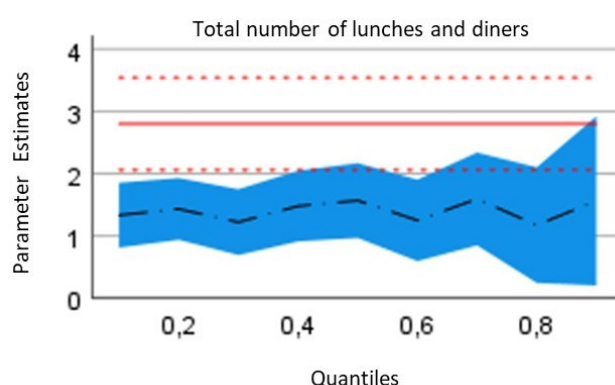


Fig. 9 –Effect of Number of Lunches and Dinners in EXPCW (Global estimate Vs Quantile Estimations)

House and Building Characteristics

Household size increases per capita household excess pollution. In relation to the surface area of the dwelling, the global regression indicates that a 10% increase in the size of a dwelling generates an average per capita increase in excess pollution of about 60 kg, which is about 3.6% of the average excess pollution. For the same surface area, having more rooms also implies extra pollution: each additional room represents an increase in excess pollution of around 30 kg of CO₂ at 2% of the global average. The results of the quantile regression show that the estimate of the overall effect of surface area on pollution would be biased upwards in relation to the quantiles with the lowest excess pollution (see Fig. 10). The graph below shows that, indeed, the quantiles between 0.1 and 0.7 show lower coefficients than the overall and consistently increasing coefficients.

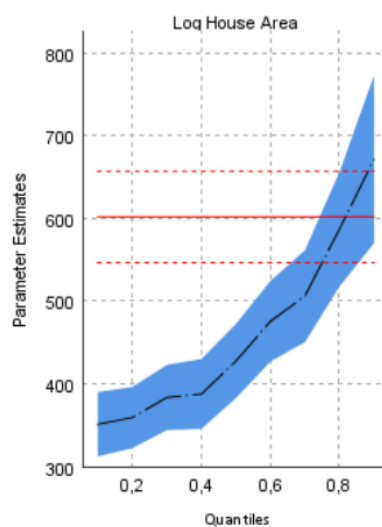


Fig. 10 –Effect of Log Area in EXPCW (Global estimate Vs Quantile Estimations)

Having heating in the home is obviously a very important polluting factor. It should be considered that, given the climatological characteristics of Spain, many households (around 37% on average) do not have heating. Specifically, the most relevant impact is the excess pollution caused by heating systems that use LPG, generating an excess of 350 kg of extra CO₂, i.e., almost 20% more than the average excess pollution. The use of natural gas (+13%), electricity (11%) or other liquid fuels (heating gas oil) also increase average pollution. As the Fig. 11 illustrates, quantile regression indicates that the overall estimate of the impact of some heating systems would be significantly biased upwards for households in the lowest pollution deciles.

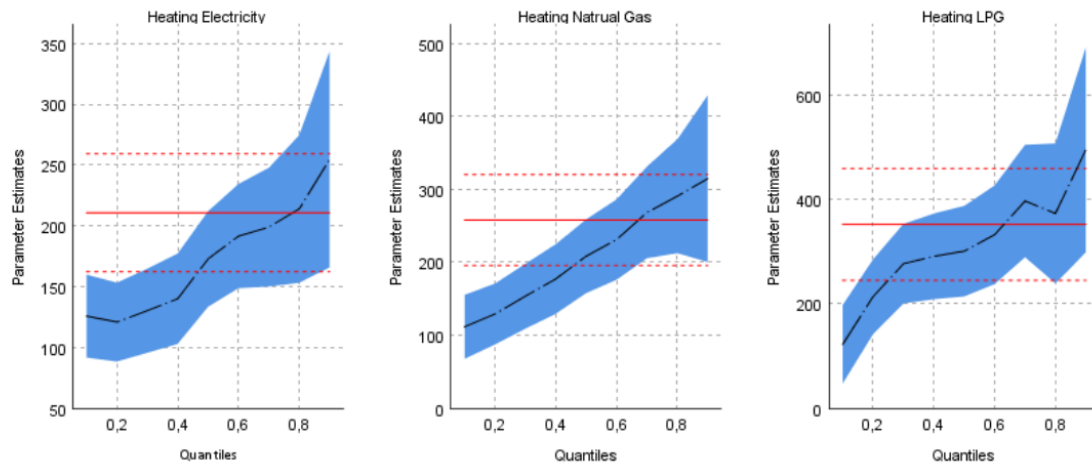


Fig. 11 –Effect of HEATING System in EXPCW (Global estimate Vs Quantile Estimations)

Similarly, the water heating system has a strong impact on more or less excess household pollution. A significant impact on the overall regression is obtained for the use of LPG, which apparently reduces excess pollution by about 5% of the mean value. This positive effect could partially offset the increase in pollution associated with the same fuel when used as a heating system. However, the quantile regression indicates that the decrease in pollution does not occur in the most polluting quantiles. The use of quantile regression also reveals that the use of solid fuels is also associated with some reduction in excess pollution in some quantiles and that, at the opposite extreme, the use of other liquid fuels (heating gas oil) increases excess pollution in the most extreme quantiles ($q=0.7, 0.8$ and 0.9).

The type of building and dwelling also offers some interesting results, but only for the lower pollution quantiles since these variables are not significant either in the overall regression or in the regressions of the 0.2 and higher quantiles. Specifically, any type of dwelling other than the block with more than 10 dwellings (very common in Spain) shows an average excess pollution of between 25% and 28% of the average excess pollution. It may be thought that these results are explained by the higher purchasing and spending power normally associated with residents in these types of single-family dwellings or with the different areas in which each type of dwelling is located but the regression also includes several measures of income and socio-economic status of the area so that these results can be understood to be specifically related to the type of dwelling.

Area Characteristics

As referred in Fremstad et al.⁴⁰ in their study conducted for the USA, some of the characteristics of the area where the home is located are fundamental to understanding CF.

The socio-economic status associated with some of the areas of residence is shown to be significant in explaining excess per-capita pollution. Residing in an area considered as

“urban luxury” implies a per capita excess pollution of close to 600 kg of CO₂, i.e., more than 30% more than the average per capita pollution. The quantile regression also shows that the coefficient for the quantiles with the highest excess pollution is statistically different from the average coefficient, reaching a value of 1396 kg of extra CO₂ for the most extreme decile (see Fig. 12). It should be noted that this effect is not associated with a simple income effect, which is included in the regression, and therefore it could be thought that, once again, it is associated with changes in expenditure patterns associated with different areas of residence.

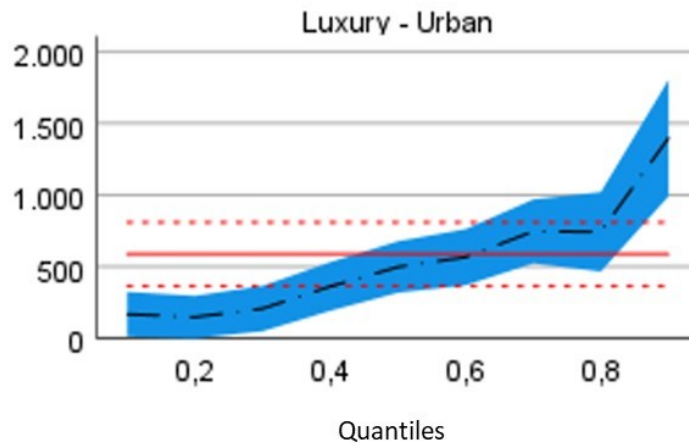


Fig. 12 –Effect of Log Area in EXPCW (Global estimate Vs Quantile Estimations)

The next socio-economic-residential category (high urban) also implies an excess pollution of about 170 kg of CO₂, i.e., about 12% extra compared to the average excess pollution. In this case, the only observable difference in the quantile regression is the coefficient for the lowest pollution decile.

In contrast to what was found in Tomas et al. (2020), the size of the population centre or population density, considered in a way that is already controlled by the rest of the variables, are not generally shown to be significantly related to excess pollution, although some partial effects of interest are observed. The areas with the highest population density show a slight reduction in excess pollution per capita, but this barely reaches 5% of the average excess pollution and is only found in the quantiles with the highest pollution.

Something similar happens with the nuclei of average population density which, once again, present a significant negative coefficient in these same quantiles. In some sense, the so-called “relief by density” mentioned by Tomas et al.²³ is partially verified, but we insist that only in a relatively small way. As emphasised by these authors and Druckman et al.⁸, there are likely to be conflicting effects when population density is considered as a potential driver in the reduction of pollutant emissions. While areas of higher human concentration favour greater access to natural gas (reducing the share of other more polluting fuels) and less use of private vehicles for commuting, it is also true that large

cities have a wide variety of polluting goods and services that are not typically used in smaller settings.

In line with what was argued in the conclusions of Salo et al.¹ for the case of Finland, the findings shown here for the case of Spain allow us to conclude that it is possible that these variables, very relevant in other similar empirical exercises, are not significant due to the presence of the variable indicating the geographical region (NUTS1) in which the household resides. In fact, some of these regional indicators show a lower excess of pollution per capita compared to the reference category which, in our case, is identified with Madrid, the region in which the capital of Spain is located. Four areas, the north-west and north-east, the central region and the island region of the Canary Islands, have less excess pollution (between 5% and 10% depending on the region). In this case, and in relation to the quantile regression exercise, none of these regional effects appear statistically different when examined across the different quantiles.

Finally, it is worth insisting on one of the most relevant technical aspects of this research: the use of “excess household CF” instead of total CF. In this regard, Annex IV contains a summary table with the differences in the standardized coefficients obtained when the QR is performed using one or the other variable. As can be seen, the differences are generalized and notable for many of the variables. Although the significance and signs remain almost unchanged in both regressions, the size of the coefficients changes notably, which reinforces the idea that exploring excess CF is not equivalent to exploring total CF.

4. Conclusions

This study provides new evidence on the determinants of CF at the household level, using the Spanish case as an example. As highlighted by Salo et al.¹, knowledge of the drivers of CF from the consumers’ perspective is essential, and a necessary complement to carry out coordinated policies from the dual perspective of consumption and production. To this end, the demand-side-solution approach is used, combining information from E-MRIO data and the HBS for Spain in 2018.

Compared to previous analyses, this article presents two important novelties. On the one hand, the quantification of Excess CF per capita (EXPCW) instead of its gross value and, on the other hand, the use of Quantile Regression, avoiding biases in the parameters, distortions due to outliers and quantifying different effects depending on the different levels of CF. Our results clearly indicate that focusing on the EXPCW and distinguishing its determinants for different deciles, we get an unbiased view of the determinants of the CF to the extent that the information available on households in the HBS allows us to correct for biases arising from a potential omission of relevant variables.

Many of the coefficients obtained in the quantile regression for the explanatory variables referred to in the literature are shown to be clearly different from those obtained in a single OLS regression and different for the EXPCW deciles. The results indicate that the OLS regression coefficients are not the weighted averages of the

different deciles but are often clearly biased upward or downward compared to every single decile. One of the most relevant examples refers to the results obtained on the primary breadwinner income variable.

The results clearly show an overestimation bias when an OLS estimation is performed as usual. The same happens with very relevant household characteristics such as the house surface where the results of the quantile regression show that the commonly used OLS estimate would be clearly biased upwards.

By gaining an unbiased view of the importance of each of the determinants in CF, the QR would eventually allow for a more accurate and fine-tuning of policy measures aimed at reducing CF, as also highlighted by Tomás et al.²³. Additionally, having different results according to the household pollution decile allows a much more accurate assessment of the effect of these measures on Spanish households as a whole. A measure can be efficient and effective depending on the number of households it affects and how significant its impact on pollution is in each case. What the quantile regression indicates is that both things vary significantly according to the per capita pollution deciles analysed, and that, therefore, focusing on OLS coefficients would bias the overall calculations. Focusing on the specific pollution per capita deciles, we can modulate the specific actions for each decile and calculate the overall combined effect.

From the results obtained in this research, it is clear that income and geographical location play a fundamental role in defining the different CF patterns of Spanish households. Recognising the fundamental role of income as a driver of an increase in the CF and correctly estimating its elasticity, a progressive direct tax on carbon footprint through the household income tax is proposed, modulated with deductions on investments in elements that reduce emissions (household infrastructure such as photovoltaic panels -or others-, more efficient thermal enclosures - doors, windows -, purchase of non-polluting vehicles, ...) financed directly with the proceeds of this tax.

A successful "green tax rate" can deepen the implementation of policies in favour of introducing economic incentives, adopting renewable energy, changing household behaviour, improving national infrastructure, enhancing stakeholder engagement, and promoting sustainability education (see Allen et al.⁴¹ or Shittu⁷ a detailed definition of these measures referred in several literature papers).

Insofar as a semi-federal system such as the Spanish one allows a different taxation by different geographical areas; it is of special interest to observe the regional distribution of these income/CF elasticities in the different autonomous communities.

Finally, it is important to highlight a strong limitation in the data used in all research like this one: the HBS reflects euros spent on each good, but not their exact quantity and quality. In this sense, higher expenditure in a given category could be masking not higher consumption, but higher quality (and therefore price) of the good. This effect could affect some of the findings that are only partially solved by the income variable, which should be understood more as a necessary control than as an explanatory variable, since

it undoubtedly includes a wide variety of concepts beyond relative wealth (to a certain extent, it is what some econometricians call the “suitcase variable”).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Annex I: Frequently used variables to explain CF from a demand – side perspectives in recent literature

Drivers	Authors
Income	Vita et al. (2019) Buhl et al., 2018) Dutta and Gupta (2018) Duarte et al. (2017) Rakic and Rakic (2015) Zhang et al. (2017) Pottier (2022)
Socio-economic aspects (household size, age structure, civil status...)	Minx et al., 2013
Role of sustainability attitudes (educational aspects included)	Al-Marri et al. (2018) Herrmann et al. (2018) Longo et al. (2019) Druckman and Jackson (2016) Moser and Kleinhückelkotten (2018)
Urban/rural location	Creutzig et al., (2016) Jalas and Juntunen (2015) Tomas et al. (2020)
Demographical density	Gill and Moeller, 2018 Ottelin et al., 2019 Wiedenhoffer et al., 2019
Housing characteristics: Type of energy supply (heating, lighting...) Dwelling type	Liao et al., 2019 Gianniou et al. (2018) Sole and Wagner ⁴³ (2018)
Lifestyles - consumption patterns: food and leisure habits, transportation, clothing, Household use of technology	Cai et al. (2019) Pothitou et al. (2017) Allen et al. (2019)

Annex II: Detailed QR Estimation Results

DECILE 0.1	Coef.	S.Error	t-Test	Sig.
INTERCEPT	-3371.2	195.4	-17.25	0.000
REGION=NORTHWEST	-96.6	23.4	-4.12	0.000
REGION=NORTHEAST	-30.8	21.6	-1.43	0.154
REGION=CENTRAL	-65.1	23.4	-2.78	0.005
REGION=EAST	-11.0	22.5	-0.49	0.624
REGION=SOUTH	32.4	25.1	1.29	0.197
REGION=CANARY ISLANDS	-50.6	32.6	-1.55	0.120
<i>REGION_Reference=MADRID</i>	-	-	-	-
POPULATION SIZE= 100,000 inhabitants or more	-23.0	29.2	-0.79	0.431
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants	21.0	25.8	0.82	0.415
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants	-4.7	19.7	-0.24	0.810
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants	-8.8	20.4	-0.43	0.666
<i>POPULATION SIZE_Reference=Less than 10.000 inhabitants</i>	-	-	-	-
HOUSEHOLD SIZE=Equivalent OECD scale	-799.5	119.3	-6.70	0.000
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	121.8	6.7	18.20	0.000
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	138.8	22.7	6.11	0.000
HOUSEHOLD TYPE=Other households with one person or couple without children	110.8	21.8	5.08	0.000
HOUSEHOLD TYPE=Couple with children under 16 years old or adult with children under 16 yo	-50.8	25.9	-1.96	0.050
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	-248.7	61.5	-4.05	0.000
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	-253.7	64.2	-3.95	0.000
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	-213.1	81.8	-2.60	0.009
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	-213.0	80.5	-2.65	0.008
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	-254.5	80.4	-3.17	0.002
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	-302.6	80.7	-3.75	0.000
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	-360.2	83.1	-4.34	0.000
HOUSEHOLD COMPOSITION=Number of dependent children	30.7	13.3	2.31	0.021
HOUSING= Log Area	351.2	19.8	17.75	0.000
BUILDING TYPE= Detached single-family house	532.1	121.3	4.39	0.000
BUILDING TYPE= Semi-detached or semi-detached house	483.6	120.6	4.01	0.000
BUILDING TYPE= Building with more than one dwelling	485.3	120.5	4.03	0.000
BUILDING TYPE= Building with less than 10 dwellings	483.8	120.2	4.02	0.000
<i>BUILDING TYPE_Reference= Building with more than 10 dwellings</i>	-	-	-	-
HOUSING= Number of rooms	15.6	5.8	2.70	0.007
TYPE OF HEATING= Electricity	125.7	17.4	7.23	0.000
TYPE OF HEATING= Natural Gas	111.6	22.4	4.99	0.000
TYPE OF HEATING= LPG	122.6	38.5	3.19	0.001
TYPE OF HEATING= Other liquid fuels	116.0	29.8	3.89	0.000
TYPE OF HEATING= Solid Fuels	10.1	36.6	0.28	0.782
TYPE OF HEATING= Other liquid fuels	242.0	131.0	1.85	0.065
<i>TYPE OF HEATING_Reference=NO Heating</i>	-	-	-	-
HOT WATER SYSTEM= Electricity	-20.0	20.8	-0.96	0.337
HOT WATER SYSTEM= LPG	-105.8	22.4	-4.73	0.000
HOT WATER SYSTEM= Other liquid fuels	32.8	35.4	0.93	0.354
HOT WATER SYSTEM= Solid Fuels	-118.8	71.5	-1.66	0.097
HOT WATER SYSTEM= Other	-51.8	48.7	-1.06	0.288
<i>HOT WATER SYSTEM_Reference=NO Hot water system</i>	-	-	-	-
AREA OF RESIDENCE= Urban luxury	169.1	79.5	2.13	0.033
AREA OF RESIDENCE= Urban high	37.3	22.6	1.65	0.100
AREA OF RESIDENCE= Rural agrarian	-15.6	18.2	-0.86	0.392
AGE	22.5	3.1	7.22	0.000
AGE SQUARED	-0.2	0.0	-6.47	0.000
COUNTRY OF BIRTH=Rest of European Union (EU 27)	36.2	33.4	1.08	0.279
COUNTRY OF BIRTH=Rest of Europe	-293.2	78.2	-3.75	0.000
COUNTRY OF BIRTH=Rest of the World	-80.8	22.7	-3.56	0.000
<i>COUNTRY OF BIRTH_Reference=Spain</i>	-	-	-	-
FAMILY WEALTH: Log INCOME (Exact amount of net monthly income of the main breadwinner)	392.2	11.2	34.88	0.000
FAMILY HABITS = Total number of lunches and dinners	1.3	0.3	5.02	0.000
POPULATION DENSITY= Densely populated area	12.7	26.6	0.48	0.634
POPULATION DENSITY= Area with intermediate population density	-4.6	16.8	-0.28	0.782
<i>POPULATION DENSITY_Reference=Sparsely populated area</i>	-	-	-	-
FAMILY WEALTH= Other homes available	428.8	13.8	30.97	0.000
EDUCATION =Cannot read or write or went to school for less than 5 years	-124.3	64.2	-1.94	0.053
EDUCATION =Primary education or attended school for at least 5 years	-160.2	57.3	-2.80	0.005
EDUCATION =Secondary education or lower secondary education	-74.2	55.7	-1.33	0.183
EDUCATION =High School, Vocational Training (Intermediate and Basic)	-30.4	55.4	-0.55	0.584
EDUCATION =Advanced vocational training	-14.6	56.1	-0.26	0.795
EDUCATION =Undergraduate Degree	-22.4	55.5	-0.40	0.687
EDUCATION =Bachelor's Degree	12.4	54.6	0.23	0.820
<i>EDUCATION_Reference=Post Graduate education</i>	-	-	-	-
OCCUPATION = (Never have worked)	59.9	31.3	1.92	0.055
OCCUPATION =Managers	115.9	29.8	3.89	0.000
OCCUPATION =Technicians and professionals	81.2	21.6	3.75	0.000
OCCUPATION =Clerical-type and service and trade employees	40.2	18.5	2.18	0.029
OCCUPATION =Craftsmen and low skilled workers	68.1	17.5	3.89	0.000
<i>OCCUPATION_Reference=Non skilled workers</i>	-	-	-	-

DECILE 0.2	Coef.	S.Error	t-Test	Sig.
INTERCEPT	-2950.0	186.0	-15.86	0.000
REGION=NORTHWEST	-102.2	22.3	-4.58	0.000
REGION=NORTHEAST	-44.0	20.6	-2.14	0.032
REGION=CENTRAL	-53.8	22.3	-2.42	0.016
REGION=EAST	-24.6	21.4	-1.15	0.250
REGION=SOUTH	26.2	23.9	1.10	0.273
REGION=CANARY ISLANDS	-61.9	31.1	-1.99	0.046
<i>REGION_Reference=MADRID</i>	-	-	-	-
POPULATION SIZE= 100,000 inhabitants or more	-11.1	27.8	-0.40	0.689
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants	26.3	24.6	1.07	0.284
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants	-5.2	18.7	-0.28	0.782
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants	-11.7	19.4	-0.60	0.546
<i>POPULATION SIZE_Reference=Less than 10.000 inhabitants</i>	-	-	-	-
HOUSEHOLD SIZE=Equivalent OECD scale	-901.2	113.5	-7.94	0.000
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	156.6	6.4	24.59	0.000
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	127.1	21.6	5.88	0.000
HOUSEHOLD TYPE=Other households with one person or couple without children	123.3	20.8	5.94	0.000
HOUSEHOLD TYPE=Couple with children under 16 years old or adult with children under 16 yo	-37.9	24.7	-1.54	0.125
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	-318.1	58.5	-5.43	0.000
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	-334.0	61.2	-5.46	0.000
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	-301.7	77.9	-3.87	0.000
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	-318.3	76.7	-4.15	0.000
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	-373.1	76.5	-4.87	0.000
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	-414.1	76.9	-5.39	0.000
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	-479.1	79.1	-6.06	0.000
HOUSEHOLD COMPOSITION=Number of dependent children	26.8	12.6	2.12	0.034
HOUSING= Log Area	359.3	18.8	19.07	0.000
BUILDING TYPE= Detached single-family house	243.3	115.5	2.11	0.035
BUILDING TYPE= Semi-detached or semi-detached house	125.3	114.9	1.09	0.275
BUILDING TYPE= Building with more than one dwelling	125.7	114.7	1.10	0.273
BUILDING TYPE= Building with less than 10 dwellings	119.1	114.5	1.04	0.298
<i>BUILDING TYPE_Reference= Building with more than 10 dwellings</i>	-	-	-	-
HOUSING= Number of rooms	18.6	5.5	3.38	0.001
TYPE OF HEATING= Electricity	120.8	16.6	7.30	0.000
TYPE OF HEATING= Natural Gas	129.2	21.3	6.07	0.000
TYPE OF HEATING= LPG	214.2	36.6	5.85	0.000
TYPE OF HEATING= Other liquid fuels	159.9	28.4	5.63	0.000
TYPE OF HEATING= Solid Fuels	16.6	34.8	0.48	0.633
TYPE OF HEATING= Other liquid fuels	174.7	124.7	1.40	0.161
<i>TYPE OF HEATING_Reference=NO Heating</i>	-	-	-	-
HOT WATER SYSTEM= Electricity	-15.4	19.8	-0.78	0.438
HOT WATER SYSTEM= LPG	-116.6	21.3	-5.48	0.000
HOT WATER SYSTEM= Other liquid fuels	1.2	33.7	0.03	0.972
HOT WATER SYSTEM= Solid Fuels	-176.5	68.1	-2.59	0.010
HOT WATER SYSTEM= Other	-81.7	46.4	-1.76	0.078
<i>HOT WATER SYSTEM_Reference=NO Hot water system</i>	-	-	-	-
AREA OF RESIDENCE= Urban luxury	148.5	75.7	1.96	0.050
AREA OF RESIDENCE= Urban high	44.5	21.5	2.06	0.039
AREA OF RESIDENCE= Rural agrarian	-10.6	17.3	-0.61	0.542
AGE	24.5	3.0	8.27	0.000
AGE SQUARED	-0.2	0.0	-7.49	0.000
COUNTRY OF BIRTH=Rest of European Union (EU 27)	16.7	31.8	0.52	0.600
COUNTRY OF BIRTH=Rest of Europe	-195.7	74.4	-2.63	0.009
COUNTRY OF BIRTH=Rest of the World	-69.0	21.6	-3.19	0.001
<i>COUNTRY OF BIRTH_Reference=Spain</i>	-	-	-	-
FAMILY WEALTH: Log INCOME (Exact amount of net monthly income of the main breadwinner)	448.9	10.7	41.93	0.000
FAMILY HABITS = Total number of lunches and dinners	1.4	0.3	5.67	0.000
POPULATION DENSITY= Densely populated area	-10.7	25.3	-0.42	0.672
POPULATION DENSITY= Area with intermediate population density	-6.2	16.0	-0.39	0.698
<i>POPULATION DENSITY_Reference=Sparsely populated area</i>	-	-	-	-
FAMILY WEALTH= Other homes available	476.7	13.2	36.16	0.000
EDUCATION =Cannot read or write or went to school for less than 5 years	-241.6	61.1	-3.95	0.000
EDUCATION =Primary education or attended school for at least 5 years	-250.8	54.5	-4.60	0.000
EDUCATION =Secondary education or lower secondary education	-169.8	53.0	-3.20	0.001
EDUCATION =High School, Vocational Training (Intermediate and Basic)	-120.4	52.8	-2.28	0.023
EDUCATION =Advanced vocational training	-121.7	53.5	-2.28	0.023
EDUCATION =Undergraduate Degree	-108.2	52.9	-2.05	0.041
EDUCATION =Bachelor's Degree	-83.6	52.0	-1.61	0.108
<i>EDUCATION_Reference=Post Graduate education</i>	-	-	-	-
OCCUPATION = (Never have worked)	92.1	29.8	3.09	0.002
OCCUPATION =Managers	159.7	28.4	5.63	0.000
OCCUPATION =Technicians and professionals	117.5	20.6	5.70	0.000
OCCUPATION =Clerical-type and service and trade employees	69.9	17.6	3.98	0.000
OCCUPATION =Craftsmen and low skilled workers	67.4	16.7	4.04	0.000
<i>OCCUPATION_Reference=Non skilled workers</i>	-	-	-	-

DECILE 0.3	Coef.	S.Error	t-Test	Sig.
INTERCEPT	-2725.8	198.3	-13.75	0.000
REGION=NORTHWEST	-119.9	23.8	-5.04	0.000
REGION=NORTHEAST	-51.7	21.9	-2.36	0.018
REGION=CENTRAL	-61.3	23.7	-2.58	0.010
REGION=EAST	-19.3	22.8	-0.85	0.397
REGION=SOUTH	35.8	25.5	1.41	0.159
REGION=CANARY ISLANDS	-35.4	33.1	-1.07	0.285
<i>REGION_Reference=MADRID</i>	-	-	-	-
POPULATION SIZE= 100,000 inhabitants or more	-16.7	29.7	-0.56	0.575
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants	18.9	26.2	0.72	0.470
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants	2.6	20.0	0.13	0.898
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants	-5.5	20.7	-0.27	0.790
<i>POPULATION SIZE_Reference=Less than 10.000 inhabitants</i>	-	-	-	-
HOUSEHOLD SIZE=Equivalent OECD scale	-1029.0	121.0	-8.50	0.000
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	175.4	6.8	25.84	0.000
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	129.5	23.1	5.62	0.000
HOUSEHOLD TYPE=Other households with one person or couple without children	131.2	22.1	5.93	0.000
HOUSEHOLD TYPE=Couple with children under 16 years old or adult with children under 16 yo	-91.1	26.3	-3.46	0.001
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	-304.0	62.4	-4.87	0.000
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	-325.8	65.2	-5.00	0.000
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	-313.8	83.1	-3.78	0.000
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	-328.3	81.7	-4.02	0.000
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	-389.3	81.6	-4.77	0.000
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	-429.7	81.9	-5.24	0.000
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	-497.7	84.3	-5.90	0.000
HOUSEHOLD COMPOSITION=Number of dependent children	18.7	13.5	1.39	0.165
HOUSING= Log Area	383.6	20.1	19.10	0.000
BUILDING TYPE= Detached single-family house	163.4	123.1	1.33	0.185
BUILDING TYPE= Semi-detached or semi-detached house	37.8	122.4	0.31	0.758
BUILDING TYPE= Building with more than one dwelling	27.3	122.3	0.22	0.823
BUILDING TYPE= Building with less than 10 dwellings	16.9	122.0	0.14	0.890
<i>BUILDING TYPE_Reference= Building with more than 10 dwellings</i>	-	-	-	-
HOUSING= Number of rooms	19.7	5.9	3.36	0.001
TYPE OF HEATING= Electricity	130.2	17.6	7.38	0.000
TYPE OF HEATING= Natural Gas	153.6	22.7	6.77	0.000
TYPE OF HEATING= LPG	277.4	39.0	7.11	0.000
TYPE OF HEATING= Other liquid fuels	163.9	30.3	5.42	0.000
TYPE OF HEATING= Solid Fuels	20.1	37.1	0.54	0.589
TYPE OF HEATING= Other liquid fuels	171.1	132.9	1.29	0.198
<i>TYPE OF HEATING_Reference=NO Heating</i>	-	-	-	-
HOT WATER SYSTEM= Electricity	-32.3	21.1	-1.53	0.126
HOT WATER SYSTEM= LPG	-122.7	22.7	-5.41	0.000
HOT WATER SYSTEM= Other liquid fuels	-2.7	35.9	-0.07	0.941
HOT WATER SYSTEM= Solid Fuels	-247.3	72.6	-3.41	0.001
HOT WATER SYSTEM= Other	-81.3	49.5	-1.64	0.100
<i>HOT WATER SYSTEM_Reference=NO Hot water system</i>	-	-	-	-
AREA OF RESIDENCE= Urban luxury	207.9	80.7	2.58	0.010
AREA OF RESIDENCE= Urban high	70.7	23.0	3.08	0.002
AREA OF RESIDENCE= Rural agrarian	-5.6	18.4	-0.30	0.762
AGE	22.9	3.2	7.26	0.000
AGE SQUARED	-0.2	0.0	-6.74	0.000
COUNTRY OF BIRTH=Rest of European Union (EU 27)	31.6	33.9	0.93	0.351
COUNTRY OF BIRTH=Rest of Europe	-101.7	79.3	-1.28	0.200
COUNTRY OF BIRTH=Rest of the World	-43.2	23.0	-1.87	0.061
<i>COUNTRY OF BIRTH_Reference=Spain</i>	-	-	-	-
FAMILY WEALTH: Log INCOME (Exact amount of net monthly income of the main breadwinner)	481.3	11.4	42.17	0.000
FAMILY HABITS = Total number of lunches and dinners	1.2	0.3	4.53	0.000
POPULATION DENSITY= Densely populated area	-23.2	27.0	-0.86	0.391
POPULATION DENSITY= Area with intermediate population density	-18.3	17.0	-1.08	0.281
<i>POPULATION DENSITY_Reference=Sparsely populated area</i>	-	-	-	-
FAMILY WEALTH= Other homes available	517.4	14.1	36.83	0.000
EDUCATION =Cannot read or write or went to school for less than 5 years	-299.8	65.1	-4.60	0.000
EDUCATION =Primary education or attended school for at least 5 years	-285.4	58.1	-4.91	0.000
EDUCATION =Secondary education or lower secondary education	-191.1	56.5	-3.38	0.001
EDUCATION =High School, Vocational Training (Intermediate and Basic)	-144.9	56.2	-2.58	0.010
EDUCATION =Advanced vocational training	-143.1	57.0	-2.51	0.012
EDUCATION =Undergraduate Degree	-95.1	56.4	-1.69	0.091
EDUCATION =Bachelor's Degree	-113.7	55.4	-2.05	0.040
<i>EDUCATION_Reference=Post Graduate education</i>	-	-	-	-
OCCUPATION = (Never have worked)	89.5	31.7	2.82	0.005
OCCUPATION =Managers	174.0	30.2	5.76	0.000
OCCUPATION =Technicians and professionals	114.1	22.0	5.20	0.000
OCCUPATION =Clerical-type and service and trade employees	55.7	18.7	2.97	0.003
OCCUPATION =Craftsmen and low skilled workers	57.5	17.8	3.23	0.001
<i>OCCUPATION_Reference=Non skilled workers</i>	-	-	-	-

DECILE 0.4	Coef.	S.Error	t-Test	Sig.
INTERCEPT	-2451.7	212.9	-11.52	0.000
REGION=NORTHWEST	-146.1	25.5	-5.72	0.000
REGION=NORTHEAST	-80.3	23.5	-3.41	0.001
REGION=CENTRAL	-84.8	25.5	-3.33	0.001
REGION=EAST	-29.9	24.5	-1.22	0.222
REGION=SOUTH	46.2	27.3	1.69	0.091
REGION=CANARY ISLANDS	-48.9	35.5	-1.38	0.168
<i>REGION_Reference=MADRID</i>	-	-	-	-
POPULATION SIZE= 100,000 inhabitants or more	-43.4	31.8	-1.36	0.173
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants	-0.3	28.1	-0.01	0.991
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants	-8.5	21.4	-0.40	0.690
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants	-10.5	22.2	-0.47	0.636
<i>POPULATION SIZE_Reference=Less than 10.000 inhabitants</i>	-	-	-	-
HOUSEHOLD SIZE=Equivalent OECD scale	-1102.9	129.9	-8.49	0.000
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	205.9	7.3	28.25	0.000
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	125.5	24.8	5.07	0.000
HOUSEHOLD TYPE=Other households with one person or couple without children	115.8	23.8	4.87	0.000
HOUSEHOLD TYPE=Couple with children under 16 years old or adult with children under 16 yo	-96.0	28.2	-3.40	0.001
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	-360.3	67.0	-5.38	0.000
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	-403.5	70.0	-5.77	0.000
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	-410.7	89.2	-4.61	0.000
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	-428.7	87.7	-4.89	0.000
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	-491.9	87.6	-5.62	0.000
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	-537.6	87.9	-6.11	0.000
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	-616.8	90.5	-6.81	0.000
HOUSEHOLD COMPOSITION=Number of dependent children	17.0	14.4	1.18	0.240
HOUSING= Log Area	387.8	21.6	17.99	0.000
BUILDING TYPE= Detached single-family house	86.7	132.2	0.66	0.512
BUILDING TYPE= Semi-detached or semi-detached house	-57.5	131.4	-0.44	0.662
BUILDING TYPE= Building with more than one dwelling	-65.6	131.3	-0.50	0.618
BUILDING TYPE= Building with less than 10 dwellings	-80.0	131.0	-0.61	0.542
<i>BUILDING TYPE_Reference= Building with more than 10 dwellings</i>	-	-	-	-
HOUSING= Number of rooms	22.8	6.3	3.63	0.000
TYPE OF HEATING= Electricity	140.1	18.9	7.39	0.000
TYPE OF HEATING= Natural Gas	177.2	24.4	7.28	0.000
TYPE OF HEATING= LPG	291.4	41.9	6.96	0.000
TYPE OF HEATING= Other liquid fuels	192.9	32.5	5.94	0.000
TYPE OF HEATING= Solid Fuels	47.7	39.9	1.20	0.231
TYPE OF HEATING= Other liquid fuels	183.7	142.7	1.29	0.198
<i>TYPE OF HEATING_Reference=NO Heating</i>	-	-	-	-
HOT WATER SYSTEM= Electricity	-20.8	22.7	-0.92	0.359
HOT WATER SYSTEM= LPG	-113.5	24.4	-4.66	0.000
HOT WATER SYSTEM= Other liquid fuels	-24.1	38.5	-0.63	0.532
HOT WATER SYSTEM= Solid Fuels	-218.8	77.9	-2.81	0.005
HOT WATER SYSTEM= Other	-111.8	53.1	-2.11	0.035
<i>HOT WATER SYSTEM_Reference=NO Hot water system</i>	-	-	-	-
AREA OF RESIDENCE= Urban luxury	362.0	86.6	4.18	0.000
AREA OF RESIDENCE= Urban high	97.2	24.7	3.94	0.000
AREA OF RESIDENCE= Rural agrarian	-16.8	19.8	-0.85	0.397
AGE	24.9	3.4	7.34	0.000
AGE SQUARED	-0.2	0.0	-6.82	0.000
COUNTRY OF BIRTH=Rest of European Union (EU 27)	50.6	36.4	1.39	0.165
COUNTRY OF BIRTH=Rest of Europe	-165.6	85.1	-1.94	0.052
COUNTRY OF BIRTH=Rest of the World	-46.7	24.7	-1.89	0.059
<i>COUNTRY OF BIRTH_Reference=Spain</i>	-	-	-	-
FAMILY WEALTH: Log INCOME (Exact amount of net monthly income of the main breadwinner)	510.1	12.3	41.64	0.000
FAMILY HABITS = Total number of lunches and dinners	1.5	0.3	5.11	0.000
POPULATION DENSITY= Densely populated area	-28.0	29.0	-0.97	0.334
POPULATION DENSITY= Area with intermediate population density	-27.7	18.3	-1.52	0.129
<i>POPULATION DENSITY_Reference=Sparsely populated area</i>	-	-	-	-
FAMILY WEALTH= Other homes available	569.6	15.1	37.77	0.000
EDUCATION =Cannot read or write or went to school for less than 5 years	-387.2	69.9	-5.54	0.000
EDUCATION =Primary education or attended school for at least 5 years	-359.9	62.4	-5.77	0.000
EDUCATION =Secondary education or lower secondary education	-249.6	60.7	-4.12	0.000
EDUCATION =High School, Vocational Training (Intermediate and Basic)	-205.2	60.4	-3.40	0.001
EDUCATION =Advanced vocational training	-195.9	61.2	-3.20	0.001
EDUCATION =Undergraduate Degree	-140.3	60.5	-2.32	0.020
EDUCATION =Bachelor's Degree	-184.0	59.5	-3.09	0.002
<i>EDUCATION_Reference=Post Graduate education</i>	-	-	-	-
OCCUPATION = (Never have worked)	61.3	34.1	1.80	0.072
OCCUPATION =Managers	229.1	32.4	7.06	0.000
OCCUPATION =Technicians and professionals	114.7	23.6	4.86	0.000
OCCUPATION =Clerical-type and service and trade employees	48.2	20.1	2.40	0.016
OCCUPATION =Craftsmen and low skilled workers	61.3	19.1	3.21	0.001
<i>OCCUPATION_Reference=Non skilled workers</i>	-	-	-	-

DECILE 0.5	Coef.	S.Error	t-Test	Sig.
INTERCEPT	-2388.5	225.2	-10.61	0.000
REGION=NORTHWEST	-174.7	27.0	-6.47	0.000
REGION=NORTHEAST	-104.7	24.9	-4.21	0.000
REGION=CENTRAL	-122.0	27.0	-4.52	0.000
REGION=EAST	-55.0	25.9	-2.12	0.034
REGION=SOUTH	22.3	28.9	0.77	0.440
REGION=CANARY ISLANDS	-68.6	37.6	-1.83	0.068
<i>REGION_Reference=MADRID</i>	-	-	-	-
POPULATION SIZE= 100,000 inhabitants or more	-80.3	33.7	-2.38	0.017
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants	-14.6	29.7	-0.49	0.623
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants	-38.0	22.7	-1.68	0.094
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants	-37.8	23.5	-1.61	0.107
<i>POPULATION SIZE_Reference=Less than 10.000 inhabitants</i>	-	-	-	-
HOUSEHOLD SIZE=Equivalent OECD scale	-1248.4	137.5	-9.08	0.000
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	243.0	7.7	31.52	0.000
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	150.1	26.2	5.73	0.000
HOUSEHOLD TYPE=Other households with one person or couple without children	125.4	25.1	4.99	0.000
HOUSEHOLD TYPE=Couple with children under 16 years old or adult with children under 16 yo	-86.0	29.9	-2.88	0.004
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	-415.6	70.9	-5.87	0.000
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	-457.4	74.1	-6.18	0.000
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	-467.1	94.3	-4.95	0.000
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	-487.7	92.8	-5.25	0.000
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	-561.8	92.7	-6.06	0.000
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	-630.4	93.1	-6.77	0.000
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	-701.5	95.8	-7.32	0.000
HOUSEHOLD COMPOSITION=Number of dependent children	11.2	15.3	0.73	0.463
HOUSING= Log Area	427.5	22.8	18.74	0.000
BUILDING TYPE= Detached single-family house	32.3	139.9	0.23	0.817
BUILDING TYPE= Semi-detached or semi-detached house	-122.6	139.1	-0.88	0.378
BUILDING TYPE= Building with more than one dwelling	-127.8	138.9	-0.92	0.357
BUILDING TYPE= Building with less than 10 dwellings	-143.2	138.6	-1.03	0.302
<i>BUILDING TYPE_Reference= Building with more than 10 dwellings</i>	-	-	-	-
HOUSING= Number of rooms	27.4	6.6	4.13	0.000
TYPE OF HEATING= Electricity	172.8	20.0	8.62	0.000
TYPE OF HEATING= Natural Gas	208.4	25.8	8.09	0.000
TYPE OF HEATING= LPG	301.4	44.3	6.80	0.000
TYPE OF HEATING= Other liquid fuels	189.4	34.4	5.51	0.000
TYPE OF HEATING= Solid Fuels	43.4	42.2	1.03	0.303
TYPE OF HEATING= Other liquid fuels	179.1	151.0	1.19	0.235
<i>TYPE OF HEATING_Reference=NO Heating</i>	-	-	-	-
HOT WATER SYSTEM= Electricity	-22.0	24.0	-0.92	0.359
HOT WATER SYSTEM= LPG	-101.6	25.8	-3.94	0.000
HOT WATER SYSTEM= Other liquid fuels	9.8	40.8	0.24	0.811
HOT WATER SYSTEM= Solid Fuels	-164.5	82.4	-2.00	0.046
HOT WATER SYSTEM= Other	-99.6	56.2	-1.77	0.076
<i>HOT WATER SYSTEM_Reference=NO Hot water system</i>	-	-	-	-
AREA OF RESIDENCE= Urban luxury	497.6	91.6	5.43	0.000
AREA OF RESIDENCE= Urban high	96.8	26.1	3.71	0.000
AREA OF RESIDENCE= Rural agrarian	-12.2	20.9	-0.58	0.559
AGE	26.2	3.6	7.31	0.000
AGE SQUARED	-0.2	0.0	-6.81	0.000
COUNTRY OF BIRTH=Rest of European Union (EU 27)	44.5	38.5	1.15	0.248
COUNTRY OF BIRTH=Rest of Europe	-86.5	90.1	-0.96	0.337
COUNTRY OF BIRTH=Rest of the World	-36.6	26.2	-1.40	0.162
<i>COUNTRY OF BIRTH_Reference=Spain</i>	-	-	-	-
FAMILY WEALTH: Log INCOME (Exact amount of net monthly income of the main breadwinner)	540.8	13.0	41.72	0.000
FAMILY HABITS = Total number of lunches and dinners	1.6	0.3	5.12	0.000
POPULATION DENSITY= Densely populated area	-16.1	30.7	-0.52	0.600
POPULATION DENSITY= Area with intermediate population density	-29.5	19.3	-1.52	0.128
<i>POPULATION DENSITY_Reference=Sparsely populated area</i>	-	-	-	-
FAMILY WEALTH= Other homes available	603.7	16.0	37.83	0.000
EDUCATION =Cannot read or write or went to school for less than 5 years	-371.1	74.0	-5.02	0.000
EDUCATION =Primary education or attended school for at least 5 years	-357.0	66.0	-5.41	0.000
EDUCATION =Secondary education or lower secondary education	-252.2	64.2	-3.93	0.000
EDUCATION =High School, Vocational Training (Intermediate and Basic)	-209.4	63.9	-3.28	0.001
EDUCATION =Advanced vocational training	-204.3	64.7	-3.16	0.002
EDUCATION =Undergraduate Degree	-150.3	64.0	-2.35	0.019
EDUCATION =Bachelor's Degree	-187.4	62.9	-2.98	0.003
<i>EDUCATION_Reference=Post Graduate education</i>	-	-	-	-
OCCUPATION = (Never have worked)	51.5	36.1	1.43	0.153
OCCUPATION =Managers	275.8	34.3	8.03	0.000
OCCUPATION =Technicians and professionals	124.7	24.9	5.00	0.000
OCCUPATION =Clerical-type and service and trade employees	63.0	21.3	2.96	0.003
OCCUPATION =Craftsmen and low skilled workers	65.3	20.2	3.23	0.001
<i>OCCUPATION_Reference=Non skilled workers</i>	-	-	-	-

DECILE 0.6	Coef.	S.Error	t-Test	Sig.
INTERCEPT	-2289.2	245.5	-9.32	0.000
REGION=NORTHWEST	-178.4	29.4	-6.06	0.000
REGION=NORTHEAST	-104.5	27.1	-3.85	0.000
REGION=CENTRAL	-124.1	29.4	-4.22	0.000
REGION=EAST	-39.2	28.3	-1.39	0.165
REGION=SOUTH	29.5	31.5	0.94	0.349
REGION=CANARY ISLANDS	-72.6	41.0	-1.77	0.076
<i>REGION_Reference=MADRID</i>	-	-	-	-
POPULATION SIZE= 100,000 inhabitants or more	-43.7	36.7	-1.19	0.234
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants	0.9	32.4	0.03	0.977
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants	-35.0	24.7	-1.42	0.156
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants	-31.1	25.6	-1.22	0.223
<i>POPULATION SIZE_Reference=Less than 10.000 inhabitants</i>	-	-	-	-
HOUSEHOLD SIZE=Equivalent OECD scale	-1483.2	149.8	-9.90	0.000
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	284.8	8.4	33.87	0.000
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	119.8	28.6	4.19	0.000
HOUSEHOLD TYPE=Other households with one person or couple without children	143.9	27.4	5.25	0.000
HOUSEHOLD TYPE=Couple with children under 16 years old or adult with children under 16 yo	-123.6	32.6	-3.80	0.000
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	-388.9	77.2	-5.03	0.000
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	-430.9	80.7	-5.34	0.000
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	-470.2	102.8	-4.57	0.000
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	-505.6	101.2	-5.00	0.000
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	-580.6	101.0	-5.75	0.000
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	-642.1	101.4	-6.33	0.000
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	-719.6	104.4	-6.89	0.000
HOUSEHOLD COMPOSITION=Number of dependent children	-9.0	16.7	-0.54	0.590
HOUSING= Log Area	475.6	24.9	19.12	0.000
BUILDING TYPE= Detached single-family house	64.0	152.5	0.42	0.675
BUILDING TYPE= Semi-detached or semi-detached house	-79.6	151.6	-0.52	0.600
BUILDING TYPE= Building with more than one dwelling	-74.5	151.4	-0.49	0.623
BUILDING TYPE= Building with less than 10 dwellings	-97.3	151.1	-0.64	0.520
<i>BUILDING TYPE_Reference= Building with more than 10 dwellings</i>	-	-	-	-
HOUSING= Number of rooms	27.5	7.2	3.79	0.000
TYPE OF HEATING= Electricity	191.5	21.9	8.76	0.000
TYPE OF HEATING= Natural Gas	231.1	28.1	8.23	0.000
TYPE OF HEATING= LPG	333.0	48.3	6.89	0.000
TYPE OF HEATING= Other liquid fuels	160.4	37.5	4.28	0.000
TYPE OF HEATING= Solid Fuels	67.0	46.0	1.46	0.145
TYPE OF HEATING= Other liquid fuels	117.2	164.6	0.71	0.476
<i>TYPE OF HEATING_Reference=NO Heating</i>	-	-	-	-
HOT WATER SYSTEM= Electricity	1.8	26.1	0.07	0.946
HOT WATER SYSTEM= LPG	-80.2	28.1	-2.85	0.004
HOT WATER SYSTEM= Other liquid fuels	76.5	44.4	1.72	0.085
HOT WATER SYSTEM= Solid Fuels	-182.1	89.9	-2.03	0.043
HOT WATER SYSTEM= Other	-104.5	61.2	-1.71	0.088
<i>HOT WATER SYSTEM_Reference=NO Hot water system</i>	-	-	-	-
AREA OF RESIDENCE= Urban luxury	565.8	99.9	5.66	0.000
AREA OF RESIDENCE= Urban high	114.4	28.4	4.02	0.000
AREA OF RESIDENCE= Rural agrarian	-17.4	22.8	-0.76	0.447
AGE	26.1	3.9	6.69	0.000
AGE SQUARED	-0.2	0.0	-6.25	0.000
COUNTRY OF BIRTH=Rest of European Union (EU 27)	39.0	42.0	0.93	0.353
COUNTRY OF BIRTH=Rest of Europe	-60.2	98.2	-0.61	0.540
COUNTRY OF BIRTH=Rest of the World	-14.9	28.5	-0.52	0.602
<i>COUNTRY OF BIRTH_Reference=Spain</i>	-	-	-	-
FAMILY WEALTH: Log INCOME (Exact amount of net monthly income of the main breadwinner)	566.7	14.1	40.11	0.000
FAMILY HABITS = Total number of lunches and dinners	1.3	0.3	3.75	0.000
POPULATION DENSITY= Densely populated area	-42.6	33.4	-1.28	0.202
POPULATION DENSITY= Area with intermediate population density	-39.0	21.1	-1.85	0.064
<i>POPULATION DENSITY_Reference=Sparsely populated area</i>	-	-	-	-
FAMILY WEALTH= Other homes available	669.0	17.4	38.46	0.000
EDUCATION =Cannot read or write or went to school for less than 5 years	-441.9	80.7	-5.48	0.000
EDUCATION =Primary education or attended school for at least 5 years	-434.6	72.0	-6.04	0.000
EDUCATION =Secondary education or lower secondary education	-325.5	70.0	-4.65	0.000
EDUCATION =High School, Vocational Training (Intermediate and Basic)	-274.1	69.6	-3.94	0.000
EDUCATION =Advanced vocational training	-277.5	70.6	-3.93	0.000
EDUCATION =Undergraduate Degree	-209.2	69.8	-3.00	0.003
EDUCATION =Bachelor's Degree	-266.5	68.6	-3.89	0.000
<i>EDUCATION_Reference=Post Graduate education</i>	-	-	-	-
OCCUPATION = (Never have worked)	69.5	39.3	1.77	0.077
OCCUPATION =Managers	343.6	37.4	9.18	0.000
OCCUPATION =Technicians and professionals	139.2	27.2	5.12	0.000
OCCUPATION =Clerical-type and service and trade employees	92.8	23.2	4.00	0.000
OCCUPATION =Craftsmen and low skilled workers	79.1	22.0	3.59	0.000
<i>OCCUPATION_Reference=Non skilled workers</i>	-	-	-	-

DECILE 0.7	Coef.	S.Error	t-Test	Sig.
INTERCEPT	-2241.9	279.6	-8.02	0.000
REGION=NORTHWEST	-176.4	33.5	-5.26	0.000
REGION=NORTHEAST	-113.6	30.9	-3.68	0.000
REGION=CENTRAL	-143.9	33.5	-4.30	0.000
REGION=EAST	-35.0	32.2	-1.09	0.277
REGION=SOUTH	42.1	35.9	1.17	0.241
REGION=CANARY ISLANDS	-72.4	46.7	-1.55	0.121
<i>REGION_Reference=MADRID</i>	-	-	-	-
POPULATION SIZE= 100,000 inhabitants or more	-95.2	41.8	-2.28	0.023
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants	-34.2	36.9	-0.93	0.355
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants	-11.7	28.1	-0.41	0.679
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants	-22.7	29.1	-0.78	0.436
<i>POPULATION SIZE_Reference=Less than 10.000 inhabitants</i>	-	-	-	-
HOUSEHOLD SIZE=Equivalent OECD scale	-1766.8	170.7	-10.35	0.000
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	329.6	9.6	34.42	0.000
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	140.1	32.5	4.31	0.000
HOUSEHOLD TYPE=Other households with one person or couple without children	171.3	31.2	5.49	0.000
HOUSEHOLD TYPE=Couple with children under 16 years old or adult with children under 16 yo	-128.9	37.1	-3.48	0.001
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	-389.2	88.0	-4.42	0.000
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	-438.4	91.9	-4.77	0.000
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	-455.9	117.1	-3.89	0.000
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	-513.0	115.2	-4.45	0.000
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	-587.3	115.1	-5.10	0.000
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	-655.4	115.5	-5.67	0.000
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	-731.8	118.9	-6.15	0.000
HOUSEHOLD COMPOSITION=Number of dependent children	-16.1	19.0	-0.85	0.397
HOUSING= Log Area	506.1	28.3	17.87	0.000
BUILDING TYPE= Detached single-family house	26.0	173.6	0.15	0.881
BUILDING TYPE= Semi-detached or semi-detached house	-119.6	172.6	-0.69	0.489
BUILDING TYPE= Building with more than one dwelling	-107.9	172.5	-0.63	0.532
BUILDING TYPE= Building with less than 10 dwellings	-125.8	172.1	-0.73	0.465
<i>BUILDING TYPE_Reference= Building with more than 10 dwellings</i>	-	-	-	-
HOUSING= Number of rooms	22.7	8.3	2.75	0.006
TYPE OF HEATING= Electricity	198.9	24.9	7.99	0.000
TYPE OF HEATING= Natural Gas	268.3	32.0	8.39	0.000
TYPE OF HEATING= LPG	397.6	55.0	7.22	0.000
TYPE OF HEATING= Other liquid fuels	150.3	42.7	3.52	0.000
TYPE OF HEATING= Solid Fuels	37.0	52.4	0.71	0.480
TYPE OF HEATING= Other liquid fuels	-11.6	187.4	-0.06	0.951
<i>TYPE OF HEATING_Reference=NO Heating</i>	-	-	-	-
HOT WATER SYSTEM= Electricity	20.3	29.8	0.68	0.496
HOT WATER SYSTEM= LPG	-45.9	32.0	-1.43	0.152
HOT WATER SYSTEM= Other liquid fuels	122.8	50.6	2.43	0.015
HOT WATER SYSTEM= Solid Fuels	-113.0	102.3	-1.10	0.270
HOT WATER SYSTEM= Other	-40.7	69.7	-0.58	0.560
<i>HOT WATER SYSTEM_Reference=NO Hot water system</i>	-	-	-	-
AREA OF RESIDENCE= Urban luxury	745.8	113.8	6.56	0.000
AREA OF RESIDENCE= Urban high	135.6	32.4	4.19	0.000
AREA OF RESIDENCE= Rural agrarian	-21.3	26.0	-0.82	0.414
AGE	27.0	4.5	6.07	0.000
AGE SQUARED	-0.2	0.0	-5.90	0.000
COUNTRY OF BIRTH=Rest of European Union (EU 27)	39.5	47.8	0.83	0.408
COUNTRY OF BIRTH=Rest of Europe	-43.7	111.8	-0.39	0.696
COUNTRY OF BIRTH=Rest of the World	-0.2	32.5	-0.01	0.994
<i>COUNTRY OF BIRTH_Reference=Spain</i>	-	-	-	-
FAMILY WEALTH: Log INCOME (Exact amount of net monthly income of the main breadwinner)	615.8	16.1	38.26	0.000
FAMILY HABITS = Total number of lunches and dinners	1.6	0.4	4.19	0.000
POPULATION DENSITY= Densely populated area	-48.2	38.1	-1.27	0.206
POPULATION DENSITY= Area with intermediate population density	-92.4	24.0	-3.85	0.000
<i>POPULATION DENSITY_Reference=Sparsely populated area</i>	-	-	-	-
FAMILY WEALTH= Other homes available	753.1	19.8	38.01	0.000
EDUCATION =Cannot read or write or went to school for less than 5 years	-382.0	91.9	-4.16	0.000
EDUCATION =Primary education or attended school for at least 5 years	-346.0	82.0	-4.22	0.000
EDUCATION =Secondary education or lower secondary education	-255.1	79.7	-3.20	0.001
EDUCATION =High School, Vocational Training (Intermediate and Basic)	-211.6	79.3	-2.67	0.008
EDUCATION =Advanced vocational training	-212.8	80.4	-2.65	0.008
EDUCATION =Undergraduate Degree	-147.0	79.5	-1.85	0.064
EDUCATION =Bachelor's Degree	-198.3	78.1	-2.54	0.011
<i>EDUCATION_Reference=Post Graduate education</i>	-	-	-	-
OCCUPATION = (Never have worked)	102.1	44.8	2.28	0.023
OCCUPATION =Managers	381.7	42.6	8.95	0.000
OCCUPATION =Technicians and professionals	174.1	31.0	5.62	0.000
OCCUPATION =Clerical-type and service and trade employees	91.2	26.4	3.45	0.001
OCCUPATION =Craftsmen and low skilled workers	82.6	25.1	3.29	0.001
<i>OCCUPATION_Reference=Non skilled workers</i>	-	-	-	-

DECILE 0.8	Coef.	S.Error	t-Test	Sig.
INTERCEPT	-1636.0	348.0	-4.70	0.000
REGION=NORTHWEST	-161.6	41.7	-3.87	0.000
REGION=NORTHEAST	-127.9	38.4	-3.33	0.001
REGION=CENTRAL	-165.9	41.7	-3.98	0.000
REGION=EAST	-40.8	40.1	-1.02	0.308
REGION=SOUTH	34.5	44.7	0.77	0.440
REGION=CANARY ISLANDS	-120.2	58.1	-2.07	0.039
<i>REGION_Reference=MADRID</i>	-	-	-	-
POPULATION SIZE= 100,000 inhabitants or more	-107.9	52.1	-2.07	0.038
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants	-31.2	45.9	-0.68	0.497
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants	-30.6	35.0	-0.87	0.382
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants	-10.5	36.2	-0.29	0.771
<i>POPULATION SIZE_Reference=Less than 10.000 inhabitants</i>	-	-	-	-
HOUSEHOLD SIZE=Equivalent OECD scale	-2142.7	212.4	-10.09	0.000
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	396.0	11.9	33.23	0.000
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	112.4	40.5	2.78	0.005
HOUSEHOLD TYPE=Other households with one person or couple without children	169.8	38.8	4.37	0.000
HOUSEHOLD TYPE=Couple with children under 16 years old or adult with children under 16 yo	-159.5	46.1	-3.46	0.001
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	-429.4	109.5	-3.92	0.000
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	-455.9	114.4	-3.98	0.000
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	-500.9	145.7	-3.44	0.001
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	-526.2	143.4	-3.67	0.000
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	-631.5	143.2	-4.41	0.000
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	-702.4	143.8	-4.89	0.000
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	-754.4	148.0	-5.10	0.000
HOUSEHOLD COMPOSITION=Number of dependent children	-7.8	23.6	-0.33	0.741
HOUSING= Log Area	586.7	35.2	16.65	0.000
BUILDING TYPE= Detached single-family house	-177.3	216.1	-0.82	0.412
BUILDING TYPE= Semi-detached or semi-detached house	-314.7	214.8	-1.47	0.143
BUILDING TYPE= Building with more than one dwelling	-298.0	214.6	-1.39	0.165
BUILDING TYPE= Building with less than 10 dwellings	-327.3	214.1	-1.53	0.126
<i>BUILDING TYPE_Reference= Building with more than 10 dwellings</i>	-	-	-	-
HOUSING= Number of rooms	22.8	10.3	2.22	0.026
TYPE OF HEATING= Electricity	213.9	31.0	6.91	0.000
TYPE OF HEATING= Natural Gas	290.6	39.8	7.30	0.000
TYPE OF HEATING= LPG	373.7	68.5	5.46	0.000
TYPE OF HEATING= Other liquid fuels	172.1	53.1	3.24	0.001
TYPE OF HEATING= Solid Fuels	10.4	65.2	0.16	0.874
TYPE OF HEATING= Other liquid fuels	169.6	233.2	0.73	0.467
<i>TYPE OF HEATING_Reference=NO Heating</i>	-	-	-	-
HOT WATER SYSTEM= Electricity	49.3	37.0	1.33	0.183
HOT WATER SYSTEM= LPG	-28.0	39.8	-0.70	0.482
HOT WATER SYSTEM= Other liquid fuels	142.4	63.0	2.26	0.024
HOT WATER SYSTEM= Solid Fuels	64.7	127.4	0.51	0.611
HOT WATER SYSTEM= Other	-57.6	86.8	-0.66	0.507
<i>HOT WATER SYSTEM_Reference=NO Hot water system</i>	-	-	-	-
AREA OF RESIDENCE= Urban luxury	743.1	141.6	5.25	0.000
AREA OF RESIDENCE= Urban high	138.8	40.3	3.44	0.001
AREA OF RESIDENCE= Rural agrarian	-39.0	32.4	-1.21	0.228
AGE	20.4	5.5	3.67	0.000
AGE SQUARED	-0.2	0.0	-3.82	0.000
COUNTRY OF BIRTH=Rest of European Union (EU 27)	16.2	59.5	0.27	0.786
COUNTRY OF BIRTH=Rest of Europe	-76.6	139.2	-0.55	0.582
COUNTRY OF BIRTH=Rest of the World	-3.4	40.4	-0.08	0.934
<i>COUNTRY OF BIRTH_Reference=Spain</i>	-	-	-	-
FAMILY WEALTH: Log INCOME (Exact amount of net monthly income of the main breadwinner)	656.9	20.0	32.80	0.000
FAMILY HABITS = Total number of lunches and dinners	1.2	0.5	2.48	0.013
POPULATION DENSITY= Densely populated area	-51.9	47.4	-1.09	0.274
POPULATION DENSITY= Area with intermediate population density	-111.5	29.9	-3.73	0.000
<i>POPULATION DENSITY_Reference=Sparsely populated area</i>	-	-	-	-
FAMILY WEALTH= Other homes available	829.8	24.7	33.66	0.000
EDUCATION =Cannot read or write or went to school for less than 5 years	-401.8	114.3	-3.51	0.000
EDUCATION =Primary education or attended school for at least 5 years	-340.8	102.0	-3.34	0.001
EDUCATION =Secondary education or lower secondary education	-253.5	99.2	-2.56	0.011
EDUCATION =High School, Vocational Training (Intermediate and Basic)	-214.9	98.7	-2.18	0.029
EDUCATION =Advanced vocational training	-208.0	100.0	-2.08	0.037
EDUCATION =Undergraduate Degree	-147.4	98.9	-1.49	0.136
EDUCATION =Bachelor's Degree	-184.8	97.2	-1.90	0.057
<i>EDUCATION_Reference=Post Graduate education</i>	-	-	-	-
OCCUPATION = (Never have worked)	19.8	55.7	0.36	0.722
OCCUPATION =Managers	473.1	53.0	8.92	0.000
OCCUPATION =Technicians and professionals	189.0	38.5	4.91	0.000
OCCUPATION =Clerical-type and service and trade employees	105.6	32.9	3.21	0.001
OCCUPATION =Craftsmen and low skilled workers	89.7	31.2	2.87	0.004
<i>OCCUPATION_Reference=Non skilled workers</i>	-	-	-	-

DECILE 0.9	Coef.	S.Error	t-Test	Sig.
INTERCEPT	-1560.3	509.5	-3.06	0.002
REGION=NORTHWEST	-115.6	61.1	-1.89	0.058
REGION=NORTHEAST	-79.8	56.3	-1.42	0.156
REGION=CENTRAL	-135.0	61.0	-2.21	0.027
REGION=EAST	61.6	58.6	1.05	0.294
REGION=SOUTH	135.7	65.4	2.07	0.038
REGION=CANARY ISLANDS	-40.8	85.0	-0.48	0.631
<i>REGION_Reference=MADRID</i>	-	-	-	-
POPULATION SIZE= 100,000 inhabitants or more	-199.7	76.2	-2.62	0.009
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants	-98.5	67.2	-1.46	0.143
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants	-56.8	51.3	-1.11	0.268
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants	-10.2	53.1	-0.19	0.848
<i>POPULATION SIZE_Reference=Less than 10.000 inhabitants</i>	-	-	-	-
HOUSEHOLD SIZE=Equivalent OECD scale	-2641.6	310.9	-8.50	0.000
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	474.9	17.4	27.22	0.000
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	158.1	59.3	2.67	0.008
HOUSEHOLD TYPE=Other households with one person or couple without children	330.5	56.9	5.81	0.000
HOUSEHOLD TYPE=Couple with children under 16 years old or adult with children under 16 yo	-173.6	67.6	-2.57	0.010
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	-446.0	160.3	-2.78	0.005
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	-469.9	167.5	-2.81	0.005
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	-511.3	213.4	-2.40	0.017
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	-525.1	210.0	-2.50	0.012
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	-674.0	209.6	-3.22	0.001
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	-712.2	210.5	-3.38	0.001
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	-802.7	216.7	-3.70	0.000
HOUSEHOLD COMPOSITION=Number of dependent children	-13.6	34.6	-0.39	0.693
HOUSING= Log Area	671.2	51.6	13.01	0.000
BUILDING TYPE= Detached single-family house	207.4	316.4	0.66	0.512
BUILDING TYPE= Semi-detached or semi-detached house	-93.3	314.5	-0.30	0.767
BUILDING TYPE= Building with more than one dwelling	-117.2	314.2	-0.37	0.709
BUILDING TYPE= Building with less than 10 dwellings	-120.2	313.5	-0.38	0.701
<i>BUILDING TYPE_Reference= Building with more than 10 dwellings</i>	-	-	-	-
HOUSING= Number of rooms	35.8	15.0	2.38	0.017
TYPE OF HEATING= Electricity	254.6	45.3	5.62	0.000
TYPE OF HEATING= Natural Gas	314.5	58.3	5.40	0.000
TYPE OF HEATING= LPG	495.6	100.3	4.94	0.000
TYPE OF HEATING= Other liquid fuels	153.3	77.8	1.97	0.049
TYPE OF HEATING= Solid Fuels	-20.0	95.4	-0.21	0.834
TYPE OF HEATING= Other liquid fuels	-127.7	341.5	-0.37	0.708
<i>TYPE OF HEATING_Reference=NO Heating</i>	-	-	-	-
HOT WATER SYSTEM= Electricity	52.2	54.2	0.96	0.336
HOT WATER SYSTEM= LPG	-71.2	58.3	-1.22	0.222
HOT WATER SYSTEM= Other liquid fuels	194.3	92.2	2.11	0.035
HOT WATER SYSTEM= Solid Fuels	85.5	186.5	0.46	0.647
HOT WATER SYSTEM= Other	102.8	127.1	0.81	0.418
<i>HOT WATER SYSTEM_Reference=NO Hot water system</i>	-	-	-	-
AREA OF RESIDENCE= Urban luxury	1396.6	207.3	6.74	0.000
AREA OF RESIDENCE= Urban high	251.9	59.0	4.27	0.000
AREA OF RESIDENCE= Rural agrarian	-89.5	47.4	-1.89	0.059
AGE	21.3	8.1	2.62	0.009
AGE SQUARED	-0.2	0.1	-2.80	0.005
COUNTRY OF BIRTH=Rest of European Union (EU 27)	-33.3	87.1	-0.38	0.702
COUNTRY OF BIRTH=Rest of Europe	-214.5	203.8	-1.05	0.293
COUNTRY OF BIRTH=Rest of the World	25.3	59.2	0.43	0.669
<i>COUNTRY OF BIRTH_Reference=Spain</i>	-	-	-	-
FAMILY WEALTH: Log INCOME (Exact amount of net monthly income of the main breadwinner)	697.7	29.3	23.79	0.000
FAMILY HABITS = Total number of lunches and dinners	1.6	0.7	2.26	0.024
POPULATION DENSITY= Densely populated area	-12.1	69.4	-0.17	0.862
POPULATION DENSITY= Area with intermediate population density	-108.0	43.7	-2.47	0.014
<i>POPULATION DENSITY_Reference=Sparsely populated area</i>	-	-	-	-
FAMILY WEALTH= Other homes available	916.5	36.1	25.39	0.000
EDUCATION =Cannot read or write or went to school for less than 5 years	-345.1	167.4	-2.06	0.039
EDUCATION =Primary education or attended school for at least 5 years	-309.5	149.3	-2.07	0.038
EDUCATION =Secondary education or lower secondary education	-165.3	145.2	-1.14	0.255
EDUCATION =High School, Vocational Training (Intermediate and Basic)	-132.3	144.5	-0.92	0.360
EDUCATION =Advanced vocational training	-151.0	146.4	-1.03	0.302
EDUCATION =Undergraduate Degree	-154.7	144.8	-1.07	0.285
EDUCATION =Bachelor's Degree	-78.4	142.3	-0.55	0.582
<i>EDUCATION_Reference=Post Graduate education</i>	-	-	-	-
OCCUPATION = (Never have worked)	-60.4	81.6	-0.74	0.459
OCCUPATION =Managers	571.4	77.7	7.36	0.000
OCCUPATION =Technicians and professionals	219.0	56.4	3.88	0.000
OCCUPATION =Clerical-type and service and trade employees	87.1	48.1	1.81	0.070
OCCUPATION =Craftsmen and low skilled workers	67.7	45.7	1.48	0.139
<i>OCCUPATION_Reference=Non skilled workers</i>	-	-	-	-

Annex III: Robustness check

AIII.1. Changes in coefficients by progressive adding of explanatory variables

VARIABLES IN THE REGRESSION	Regression Coefficients for QR for the median					
	q=0,5	q=0,5	q=0,5	q=0,5	q=0,5	q=0,5
(Intersección)	3748.4	-1573.0	-2026.6	-2281.9	-4470.2	-2612.6
HOUSEHOLD SIZE=Equivalent OECD scale	-1452.1	-2277.2	-1794.0	-1066.2	-1214.1	-1271.4
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	167.9	292.9	217.1	217.4	228.3	238.4
FAMILY WEALTH: Log INCOME (Exact amount net monthly income main breadwinner)		858.8	835.1	844.0	673.8	548.4
FAMILY HABITS = Total number of lunches and dinners		0.2	-0.2	0.5	0.9	1.5
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older			170.3	267.6	196.3	153.5
HOUSEHOLD TYPE=Other households with one person or couple without children			181.5	173.0	206.0	135.3
HOUSEHOLD TYPE= Couple with children under 16 years old or adult with children under 16 yo			-211.5	-120.9	-91.2	-93.7
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old				-504.7	-372.9	-373.7
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old				-494.0	-415.1	-419.8
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old				-487.3	-423.2	-436.4
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old				-554.9	-457.8	-460.3
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old				-538.8	-539.6	-536.4
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old				-607.0	-567.4	-597.1
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over				-723.5	-605.5	-672.0
HOUSEHOLD COMPOSITION=Number of dependent children				44.4	23.8	12.2
HOUSING= Log Area					507.9	442.1
BUILDING TYPE= Detached single-family house					65.6	-4.8
BUILDING TYPE= Semi-detached or semi-detached house					-35.3	-142.3
BUILDING TYPE= Building with more than one dwelling					-28.5	-160.7
BUILDING TYPE= Building with less than 10 dwellings					-34.9	-171.8
BUILDING TYPE= Building with more than 10 dwellings					-	-
HOUSING= Number of rooms					30.5	25.5
TYPE OF HEATING= Electricity					185.5	145.1
TYPE OF HEATING= Natural Gas					186.3	159.5
TYPE OF HEATING= LPG					259.0	206.6
TYPE OF HEATING= Other liquid fuels					160.1	126.3
TYPE OF HEATING= Solid Fuels					55.5	-3.6
TYPE OF HEATING= Other liquid fuels					73.1	117.2
HOT WATER SYSTEM= Not available					-	-
HOT WATER SYSTEM= Electricity					-12.9	-22.8
HOT WATER SYSTEM= LPG					-85.8	-83.6
HOT WATER SYSTEM= Other liquid fuels					51.7	19.7
HOT WATER SYSTEM= Solid Fuels					-196.6	-193.6
HOT WATER SYSTEM= Other					-80.8	-58.9
HOT WATER SYSTEM= Natural Gas					-	-
AREA OF RESIDENCE= Urban luxury					486.4	563.1
AREA OF RESIDENCE= Urban high					158.0	101.4
AREA OF RESIDENCE= Rural agrarian					-41.5	-21.4
AGE					40.1	28.1
AGE SQUARED					-0.3	-0.2
COUNTRY OF BIRTH=Rest of European Union (EU 27)					27.4	54.2
COUNTRY OF BIRTH=Rest of Europe					-70.3	-69.1
COUNTRY OF BIRTH=Rest of the World					-68.9	-18.4
COUNTRY OF BIRTH=Spain					-	-
POPULATION DENSITY= Densely populated area						-59.8
POPULATION DENSITY= Area with intermediate population density						-48.1
POPULATION DENSITY= Area with low population density						0.0
FAMILY WEALTH= Other homes available						611.7
FAMILY WEALTH= No Other homes available						-
EDUCATION =Cannot read or write or went to school for less than 5 years						-342.8
EDUCATION =Primary education or attended school for at least 5 years						-329.3
EDUCATION =Secondary education or lower secondary education						-235.6
EDUCATION =High School, Vocational Training (Intermediate and Basic)						-187.4
EDUCATION =Advanced vocational training						-192.9
EDUCATION =Undergraduate Degree						-140.5
EDUCATION =Bachelor's Degree						-166.0
EDUCATION _Reference=Post Graduate education						-
OCCUPATION = (Never have worked)						66.3
OCCUPATION =Managers						310.5
OCCUPATION =Technicians and professionals						134.7
OCCUPATION =Clerical-type and service and trade employees						71.5
OCCUPATION =Craftsmen and low skilled workers						61.1
OCCUPATION _Reference=Non skilled workers						-

AIII.2. Change in parameters by including/excluding “non-core” variables (“checkrob” stata)

Core-var	Max	Min	Mean	AvgSTD	PercSigni	Perc+	Perc-	AvgT	Obs
HOUSEHOLD SIZE=Equivalent OECD scale	-1233.7	-2133.1	-2029.5	44.3	100%	0%	100%	46.7	256
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	268.3	234.7	249.0	7.4	100%	100%	0%	33.8	256
REGION=NORTHWEST	-156.9	-190.7	-174.8	27.0	100%	0%	100%	6.5	256
REGION=NORTHEAST	-82.4	-104.9	-94.8	24.9	100%	0%	100%	3.8	256
REGION=CENTRAL	-100.9	-127.5	-114.1	27.0	100%	0%	100%	4.2	256
REGION=EAST	-40.7	-61.8	-53.0	26.0	70%	0%	100%	2.0	256
REGION=SOUTH	33.6	6.5	21.2	28.9	0%	100%	0%	0.7	256
REGION=CANARY ISLANDS	-52.0	-92.7	-75.8	37.6	64%	0%	100%	2.0	256
POPULATION SIZE= 100,000 inhabitants or more	-58.1	-86.2	-73.3	33.7	88%	0%	100%	2.2	256
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants	4.1	-24.8	-10.1	29.8	0%	1%	99%	0.3	256
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants	-23.4	-45.1	-34.2	22.7	3%	0%	100%	1.5	256
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants	-14.6	-39.7	-27.5	23.5	0%	0%	100%	1.2	256
HOUSING= Log Area	442.0	420.5	431.3	22.9	100%	100%	0%	18.9	256
BUILDING TYPE= Detached single-family house	85.6	-30.8	34.3	138.7	0%	86%	14%	0.3	256
BUILDING TYPE= Semi-detached or semi-detached house	-59.7	-180.0	-114.5	137.8	0%	0%	100%	0.8	256
BUILDING TYPE= Building with more than one dwelling	-71.1	-180.9	-121.9	137.7	0%	0%	100%	0.9	256
BUILDING TYPE= Building with less than 10 dwellings	-85.6	-201.2	-138.0	137.4	0%	0%	100%	1.0	256
HOUSING= Number of rooms	27.7	21.2	25.0	6.7	100%	100%	0%	3.8	256
TYPE OF HEATING= Electricity	171.8	151.8	164.0	20.1	100%	100%	0%	8.2	256
TYPE OF HEATING= Natural Gas	209.2	191.2	201.1	25.8	100%	100%	0%	7.8	256
TYPE OF HEATING= LPG	316.8	285.0	301.2	44.4	100%	100%	0%	6.8	256
TYPE OF HEATING= Other liquid fuels	191.4	169.6	180.4	34.4	100%	100%	0%	5.3	256
TYPE OF HEATING= Solid Fuels	69.3	27.8	53.5	42.3	0%	100%	0%	1.3	256
TYPE OF HEATING= Other liquid fuels	230.1	160.5	197.7	146.0	0%	100%	0%	1.4	256
HOT WATER SYSTEM= Electricity	-5.4	-27.6	-17.3	24.0	0%	0%	100%	0.7	256
HOT WATER SYSTEM= LPG	-89.5	-116.0	-101.2	25.8	100%	0%	100%	3.9	256
HOT WATER SYSTEM= Other liquid fuels	31.1	-1.1	12.9	40.8	0%	99%	1%	0.3	256
HOT WATER SYSTEM= Solid Fuels	-144.8	-211.8	-173.7	82.2	80%	0%	100%	2.1	256
HOT WATER SYSTEM= Other	-77.9	-117.1	-96.9	55.9	6%	0%	100%	1.7	256
AREA OF RESIDENCE= Urban luxury	581.0	469.8	538.2	91.5	100%	100%	0%	5.9	256
AREA OF RESIDENCE= Urban high	112.8	90.8	100.5	26.1	100%	100%	0%	3.9	256
AREA OF RESIDENCE= Rural agrarian	-2.6	-19.7	-12.2	21.0	0%	0%	100%	0.6	256
AGE	36.8	19.4	29.2	3.3	100%	100%	0%	8.8	256
AGE SQUARED	-0.2	-0.3	-0.3	0.0	100%	0%	100%	8.9	256
COUNTRY OF BIRTH=Rest of European Union (EU 27)	45.0	14.6	31.1	38.6	0%	100%	0%	0.8	256
COUNTRY OF BIRTH=Rest of Europe	-72.0	-137.9	-96.6	90.0	0%	0%	100%	1.1	256
COUNTRY OF BIRTH=Rest of the World	-33.7	-56.0	-43.9	26.2	9%	0%	100%	1.7	256
FAMILY HABITS = Total number of lunches and dinners	1.5	1.0	1.2	0.3	100%	100%	0%	3.9	256
POPULATION DENSITY= Densely populated area	-0.5	-27.3	-15.6	30.7	0%	0%	100%	0.5	256
POPULATION DENSITY= Area with intermediate population density	-15.4	-31.4	-23.8	19.4	0%	0%	100%	1.2	256
POPULATION DENSITY_Reference=Sparsely populated area	614.8	598.4	606.9	16.0	100%	100%	0%	38.1	256
OCCUPATION = (Never have worked)	89.8	41.5	64.7	35.9	30%	100%	0%	1.8	256
OCCUPATION =Managers	293.1	262.8	278.6	34.0	100%	100%	0%	8.2	256
OCCUPATION =Technicians and professionals	133.2	110.0	120.5	24.3	100%	100%	0%	5.0	256
OCCUPATION =Clerical-type and service and trade employees	67.3	54.0	60.4	20.8	100%	100%	0%	2.9	256
OCCUPATION =Craftsmen and low skilled workers	64.3	42.4	51.6	19.8	100%	100%	0%	2.6	256
EDUCATION =Cannot read or write or went to school for less than 5 years	-346.3	-422.1	-383.4	73.5	100%	0%	100%	5.2	256
EDUCATION =Primary education or attended school for at least 5 years	-334.9	-401.4	-366.2	65.4	100%	0%	100%	5.6	256
EDUCATION =Secondary education or lower secondary education	-232.6	-296.9	-264.9	63.6	100%	0%	100%	4.2	256
EDUCATION =High School, Vocational Training (Intermediate and Basic)	-177.9	-235.1	-209.6	63.3	100%	0%	100%	3.3	256
EDUCATION =Advanced vocational training	-176.1	-231.5	-206.9	64.2	100%	0%	100%	3.2	256
EDUCATION =Undergraduate Degree	-133.7	-189.9	-167.2	63.5	100%	0%	100%	2.6	256
EDUCATION =Bachelor's Degree	-169.1	-222.0	-198.1	62.4	100%	0%	100%	3.2	256
FAMILY WEALTH: Log INCOME (Exact amount net monthly income main breadwinner)	551.4	516.4	533.7	12.9	100%	100%	0%	41.6	256
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	176.1	64.8	128.9	25.4	100%	100%	0%	5.1	256
HOUSEHOLD TYPE=Other households with one person or couple without children	150.1	65.2	114.0	24.6	100%	100%	0%	4.6	256
HOUSEHOLD TYPE= Couple with children under 16 years old or adult with children under 16 years old	-71.9	-232.5	-144.4	25.0	100%	0%	100%	6.0	256

T-var	Max	Min	Mean	AvgSTD	PercSigni	Perc+	Perc-	AvgT	Obs
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	49.2	-420.7	-17.8	22.6	19%	51%	49%	1.2	128
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	45.3	-461.2	-47.7	17.2	70%	13%	88%	2.9	128
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	176.1	-472.1	93.1	18.3	98%	98%	2%	6.0	128
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	148.5	-495.9	55.1	16.6	89%	92%	8%	4.5	128
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	75.5	-567.1	-25.3	16.6	53%	31%	69%	2.6	128
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	20.8	-637.0	-93.3	16.6	94%	4%	96%	5.6	128
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	-62.5	-706.8	-143.1	26.3	100%	0%	100%	5.2	128
HOUSEHOLD COMPOSITION=Number of dependent children	58.7	-37.8	5.8	12.5	33%	55%	45%	1.5	128

Annex IV: Comparison of coefficients of the regressions on “CF Excess” and “Total CF”.

VARIABLES IN THE REGRESSION Personal Characteristics (Household Head)	COEFFICIENT DIFFERENCE RATE BETWEEN "EXCESS CF" AND "TOTAL CF"								
	Q=0.1	Q=0.2	Q=0.3	Q=0.4	Q=0.5	Q=0.6	Q=0.7	Q=0.8	Q=0.9
AGE	-4.2%	2.7%	-3.4%	-5.0%	0.3%	-3.9%	5.8%	5.8%	-16.3%
AGE SQUARED	-5.3%	1.2%	-1.8%	-4.4%	0.2%	-3.7%	5.8%	5.7%	-16.7%
OCCUPATION = (Never have worked)		6.5%	16.8%				-8.2%		
OCCUPATION =Managers	-1.3%	-4.3%	-5.0%	10.1%	0.4%	-2.5%	-1.8%	-3.6%	1.0%
OCCUPATION =Technicians and professionals	-9.4%	7.8%	-0.8%	14.2%	7.4%	1.0%	-3.7%	-2.4%	-7.7%
OCCUPATION =Clerical-type and service and trade employees	7.8%	3.6%	9.5%	5.3%	20.7%	10.1%	0.8%	9.9%	
OCCUPATION =Craftsmen and low skilled workers	0.1%	-6.0%	1.7%	13.2%	19.7%	-0.1%	-3.7%	-1.6%	
<i>OCCUPATION_Reference=Non skilled workers</i>									
EDUCATION =Cannot read or write or went to school for less than 5 years		-11.9%	-12.0%	-0.9%	2.3%	-3.6%	-2.6%	0.1%	4.8%
EDUCATION =Primary education or attended school for at least 5 years	-12.1%	-6.6%	-7.9%	0.4%	2.7%	-0.3%	-1.9%	-0.3%	2.9%
EDUCATION =Secondary education or lower secondary education		-8.1%	-10.7%	-0.5%	7.9%	1.0%	-3.0%	-1.7%	
EDUCATION =High School, Vocational Training (Intermediate and Basic)		-12.2%	-20.3%	-2.2%	12.0%	-1.9%	-1.1%	2.6%	
EDUCATION =Advanced vocational training		-11.9%	-17.5%	3.0%	12.9%	-1.7%	2.2%	-5.4%	
EDUCATION =Undergraduate Degree		-8.4%		-0.3%	13.5%	1.0%			
EDUCATION =Bachelor's Degree			-23.9%	7.2%	16.9%	-1.5%	-6.8%		
<i>EDUCATION_Reference=Post Graduate education</i>									
COUNTRY OF BIRTH=Rest of European Union (EU 27)									
COUNTRY OF BIRTH=Rest of Europe	6.6%	-9.6%							
COUNTRY OF BIRTH=Rest of the World	0.4%	-2.6%							
<i>COUNTRY OF BIRTH_Reference=Spain</i>									
Household & Family Characteristics									
HOUSEHOLD SIZE=Equivalent OECD scale	1.6%	1.8%	2.6%	1.1%	2.9%	0.7%	2.6%	1.3%	-3.6%
HOUSEHOLD SIZE (SQUARED)=Equivalent OECD scale	2.1%	0.6%	-1.0%	0.8%	0.4%	-0.6%	-0.6%	-0.5%	-2.5%
FAMILY WEALTH: Log INCOME (Exact amount of net monthly income of the main breadwinner)	-1.1%	-1.0%	-1.2%	-2.6%	-1.2%	-0.4%	-0.4%	-1.1%	-0.9%
FAMILY WEALTH= Other homes available	1.9%	2.7%	0.6%	2.5%	1.0%	1.8%	0.4%	1.7%	2.7%
FAMILY HABITS = Total number of lunches and dinners	-2.3%	-3.1%	-13.1%	6.2%	8.9%	3.4%	1.2%	-5.3%	11.8%
HOUSEHOLD TYPE=Person or couple (at least one of the partners) aged 65 years or older	-5.6%	3.5%	9.8%	0.1%	2.9%	-1.5%	21.2%	20.0%	4.9%
HOUSEHOLD TYPE=Other households with one person or couple without children	3.5%	0.4%	1.6%	2.8%	-4.8%	0.8%	7.5%	4.0%	-1.2%
HOUSEHOLD TYPE=Couple with children under 16 years old or adult with children under 16 yo	16.3%		14.7%	-11.1%	-6.3%	13.2%	-6.2%	1.4%	-5.0%
HOUSEHOLD COMPOSITION= Number of household members 0-4 years old	6.3%	-0.5%	-5.6%	1.6%	0.6%	-3.3%	-7.9%	-5.6%	5.4%
HOUSEHOLD COMPOSITION= Number of household members 5-15 years old	7.1%	1.0%	-6.2%	0.7%	-0.3%	-4.0%	-7.0%	-4.6%	4.3%
HOUSEHOLD COMPOSITION= Number of household members 16-24 years old	3.5%	-4.3%	-8.1%	-1.8%	-3.0%	-2.6%	-9.6%	-4.9%	5.1%
HOUSEHOLD COMPOSITION= Number of household members 25-34 years old	0.2%	-4.6%	-8.3%	-1.3%	-4.2%	-2.4%	-7.2%	-5.5%	6.4%
HOUSEHOLD COMPOSITION= Number of household members 35-64 years old	-1.4%	-2.4%	-7.0%	-1.5%	-3.4%	-2.2%	-7.7%	-4.8%	4.7%
HOUSEHOLD COMPOSITION= Number of household members 65-84 years old	-0.3%	-1.3%	-7.3%	-1.5%	-2.3%	-1.4%	-6.2%	-3.4%	5.6%
HOUSEHOLD COMPOSITION= Number of household members aged 85 years or over	3.6%	-0.3%	-4.8%	-0.6%	-0.4%	-1.3%	-6.4%	-4.5%	7.2%
HOUSEHOLD COMPOSITION=Number of dependent children	89.4%	26.8%							

House and Building Characteristics									
HOUSING= Log Area	2.4%	1.0%	-0.6%	-0.4%	0.8%	0.8%	-0.2%	0.3%	-2.1%
BUILDING TYPE= Detached single-family house	-0.2%	13.3%							
BUILDING TYPE= Semi-detached or semi-detached house	3.9%								
BUILDING TYPE= Building with more than one dwelling	4.2%								
BUILDING TYPE= Building with less than 10 dwellings	5.0%								
<i>BUILDING TYPE_Reference= Building with more than 10 dwellings</i>									
HOUSING= Number of romms	12.5%	4.3%	24.0%	11.3%	10.4%	7.5%	1.6%	45.9%	9.9%
TYPE OF HEATING= Electricity	1.6%	-2.5%	0.3%	-9.3%	-2.2%	-3.3%	0.7%	1.7%	-6.2%
TYPE OF HEATING= Natural Gas	-22.4%	0.4%	-1.4%	-9.3%	-6.4%	-4.3%	-1.3%	-3.2%	-5.7%
TYPE OF HEATING= LPG	-20.6%	-14.0%	-17.4%	-6.4%	-3.9%	-7.1%	-3.1%	-5.6%	-2.1%
TYPE OF HEATING= Other liquid fuels	2.0%	5.1%	0.4%	-1.2%	12.5%	0.0%	-9.1%	1.3%	-3.6%
TYPE OF HEATING= Solid Fuels									
TYPE OF HEATING= Other liquid fuels									
<i>TYPE OF HEATING_Reference=NO Heating</i>									
HOT WATER SYSTEM= Electricity									
HOT WATER SYSTEM= LPG	4.7%	-21.7%	-13.2%	-10.0%	-7.5%	-22.7%			
HOT WATER SYSTEM= Other liquid fuels							23.8%	2.9%	3.6%
HOT WATER SYSTEM= Solid Fuels		-8.0%	-16.7%	-1.6%	-15.0%	-5.6%			
HOT WATER SYSTEM= Other				-9.4%					
HOT WATER SYSTEM_Reference=NO Hot water system									
Area Characteristics									
AREA OF RESIDENCE= Urban luxury	-11.3%	15.4%	0.5%	3.2%	5.6%	5.9%	-2.7%	2.0%	-1.7%
AREA OF RESIDENCE= Urban high		43.3%	-1.4%	2.0%	-1.2%	-7.0%	7.2%	0.6%	2.9%
AREA OF RESIDENCE= Rural agrarian									
<i>AREA OF RESIDENCE_Reference=Other</i>									
REGION=NORTHWEST	-57.8%	-56.6%	-52.5%	-45.9%	-43.9%	-42.8%	-43.7%	-43.8%	
REGION=NORTHEAST		-45.4%	-38.2%	-25.5%	-27.2%	-27.3%	-25.6%	-22.8%	
REGION=CENTRAL	-69.9%	-75.6%	-72.3%	-63.9%	-57.1%	-57.6%	-54.0%	-50.2%	-54.0%
REGION=EAST					-49.6%				
REGION=SOUTH									541.5%
REGION=CANARY ISLANDS		-77.3%						-66.4%	
<i>REGION_Reference=MADRID</i>									
POPULATION SIZE= 100,000 inhabitants or more					-4.1%		-3.7%	-3.7%	-13.0%
POPULATION SIZE=50,000 or more and less than 100,000 inhabitants									
POPULATION SIZE=20,000 or more and less than 50,000 inhabitants									
POPULATION SIZE=10,000 or more and less than 20,000 inhabitants									
<i>POPULATION SIZE_Reference=Less than 10.000 inhabitants</i>									
POPULATION DENSITY= Densely populated area									
POPULATION DENSITY= Area with intermediate population density							4.2%	-1.2%	-0.1%
POPULATION DENSITY_Reference=Sparsely populated area									