

ENVIRONMENT AND HAPPINESS: NEW EVIDENCE FOR SPAIN

**JUNCAL CUÑADO
FERNANDO PÉREZ DE GRACIA**

**FUNDACIÓN DE LAS CAJAS DE AHORROS
DOCUMENTO DE TRABAJO
Nº 579/2011**

De conformidad con la base quinta de la convocatoria del Programa de Estímulo a la Investigación, este trabajo ha sido sometido a evaluación externa anónima de especialistas cualificados a fin de contrastar su nivel técnico.

ISSN: 1988-8767

La serie **DOCUMENTOS DE TRABAJO** incluye avances y resultados de investigaciones dentro de los programas de la Fundación de las Cajas de Ahorros.
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ENVIRONMENT AND HAPPINESS: NEW EVIDENCE FOR SPAIN*

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Abstract

In this paper we study the impact of sustainability and environmental conditions on happiness in the Spanish regions with individual-level data from the European Social Survey, using an ordinal logit model. The main results of the paper are the following. First, after controlling for most of the socio-economic variables affecting happiness, we still find significant regional differences in subjective well-being or happiness. Second, these regional differences cannot be explained with the usual macroeconomic regional variables, such as per capita GDP or unemployment rate. However, we find that environmental variables, such as pollution, play a significant role in explaining regional differences in happiness. Furthermore, we also find significant variables of regional climate data on individual subjective well-being. Finally, and as expected, we find significant effect of different socio-economic variables on happiness, such as health, income and unemployment status among others.

Keywords: Environment economics, Climate, Air pollution, Happiness, Regional economics.

JEL classification codes: I31; Q50, R10.

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Acknowledgements: The authors gratefully acknowledge financial support provided by the Ministerio de Ciencia y Tecnología (ECO2008-02458-E) within the EUROCORES HumVIB programme of the European Science Foundation. An earlier version of this paper has been presented at the EUNIP 2010 Conference (Reus, 2010).

1. Introduction

In recent years, there has been a large emerging body of empirical economic literature on subjective well-being (individual life satisfaction or also called happiness) and economics.¹ For example, the Chairman of the Board of Governors of the Federal Reserve System of the U.S., Ben Bernanke (2010) in a recent conference on may 2010 presented the new results on economics and happiness.

The interest on this subject may be explained by different factors. First, monetary socio-economic indicators (such as GDP per capita) have been found to be insufficient measures of the well-being of citizens (see, for example, United Nations, 1954 and Erikson, 1993 and more recently, Jones and Klenow, 2010). Thus, there is a wide range of studies that uses subjective well-being indicators to measure individual happiness (see, for example, Clark and Oswald, 1994; Di Tella *et al.*, 2001, 2003; Easterlin, 1974, 1995, 2001; Frey and Stutzer, 2002a,b; and Ferrer-i-Carbonell, 2005 among many others). Second, quality of life studies can help to evaluate the welfare effects of different factors such as health (Berger and Leigh, 1989; Veenhoven, 1991; Hartog and Oosterbeeck, 1998; Alesina *et al.*, 2004 and Blanchflower and Oswald, 2008), education (Di Tella *et al.*, 2001; Albert and Davia, 2005 and Bechetti *et al.*, 2006), macroeconomic variables (Di Tella *et al.*, 2001), airport noise (Van Praag and Baarsma, 2005), terrorism (Frey *et al.*, 2009), air pollution (Welsch 2002, 2006, 2007; Di Tella and MacCulloch, 2006, Ferreira *et al.*, 2006 and Luechinger, 2009, 2010) and climate (Frijters and van Praag, 1998; Rehdanz and Maddison, 2005; Welsch 2002, 2006, 2009; Brereton *et al.*, 2008 and Welsch and Küling, 2009) among others. Furthermore, these studies help inferring implications of different policies, such as environmental or other public policies (see, for example, Rehdanz and Maddison, 2005; Ferrer-i-Carbonell and Gowdy, 2007 among many others). Recent surveys on the relationship between economics and happiness are Frey and Stutzer (2002b), Easterlin (2005), Clark *et al.* (2006), Di Tella and MacCullough (2006), Helliwell (2006), Bruni and Porta (2007), Layard (2006) and Graham (2008) among others.

The subjective well-being literature uses the individual's self-reported satisfaction with life to understand the determinants of happiness and to evaluate the impact of different policies on individual satisfaction. In this paper we study the impact of climate

¹ Throughout the paper we use the terms happiness and life satisfaction interchangeably. Many recent studies assume happiness and life satisfaction as synonymous (see, for example Caporale *et al.*, 2009 and Cunado and Perez de Gracia, 2010). In this paper, we used both happiness and life satisfaction scores as measures of subjective well-being (i.e., dependent variable in our empirical analysis). The

and air pollution conditions on happiness in the Spanish regions using individual-level data from the European Social Survey. We combine this data set with regional data on macroeconomic obtained from Instituto Nacional de Estadística and some climate and pollution indicators obtained from Ministerio de Medio Ambiente y Medio Rural y Marino.

The objective of this paper is the analysis of the impact of individual variables (e.g., age, income, health, gender, marital status, number of children, education, employment status), macroeconomic regional variables (e.g., GDP per capita, its growth rate, and the unemployment rate), regional climate variables (e.g., average mean temperature, average mean precipitation, humidity, number of rainy days, number of sun hours) and air pollution variables (e.g., nitrogen dioxide and phosphorus) on individual happiness. This is the first paper using Spanish regional data on self reported happiness and climate and air pollution indicators. Ferreira *et al.* (2006) and Luechinger (2009) are two recent papers that focused on a regional basis. Ferreira *et al.* (2006) using data on subjective well being of the Irish regions in 2001 analyze environmental attributes linked to each respondent's dwelling area using a Geographic Information System while Luechinger (2009) using pollution data and a large panel survey for Germany, a country with a large variation in pollution, both across space and over time estimate the effect of pollution on life satisfaction and housing rents.

The remainder of the paper is structured as follows. Section 2 briefly reviews the main literature contributions on the impact of socio-economic variables, climate and other environmental variables such as air pollution indicators on individual happiness. Section 3 presents the data sources, the definition of the variables, the estimation procedure and the main results for the Spanish regions during year 2008. Finally Section 4 offers some concluding remarks.

2. Literature Review on Happiness, Climate and Air Pollution

As we have explained in the Introduction Section, in this paper we explore the connection between subjective well-being and some climate and air pollution indicators. A large number of studies attempts to address this relationship between the environment variables and subjective well-being (see, for example, Fritjers and Van Praag, 1998; Welsch, 2002, 2006, 2009; Rehdanz and Maddison, 2005; Becchetti *et al.*, 2007; Zidanseck, 2007; Ferrer-i-Carbonell and Gowdy, 2007, Brereton *et al.*, 2008 and Florida *et*

results are very similar with both proxy variables (happiness and life-satisfaction). The life satisfaction empirical evidence are available upon request.

al., 2010 among many others) and air pollutions indicators and happiness (see, for example, Welsch 2002, 2006, 2007 and Luechinger, 2010 among others). A recent survey on the connection between human well-being and environmental conditions can be found in Welsch and Kühling (2009).²

For example, Rehdanz and Maddison (2005) using a panel of 67 countries attempting to explain differences in self-reported levels of happiness. Their results suggest that climate variables such as temperature and precipitation can be used to investigate differences in self-reported subjective well-being. They found that higher mean temperatures in a coldest month increase happiness while higher mean temperatures in the hottest month decrease happiness. Finally, they also obtained that precipitation does not significantly affect happiness. In other related study, Becchetti *et al.* (2007) using data from World Value Survey (third and four waves), World Development Indicators, Fraser Institute of Economic and Freedom Index and the National Oceanic and Atmospheric Administration of the US Department of Commerce showed that the number of rainy days increases life satisfaction up to a peak of around 110 days while it reduces it afterwards suggesting that rain has a hump-shaped impact and should depend on the effect of it on the reduction of sun brightness and visibility. After a minimum of 140 days of fog, the satisfaction level starts increasing. Furthermore, the paper found that the effect of fog is negative detecting an U-shaped impact. In addition, they obtained that the temperature has also a U-shaped effect on people's satisfaction. Brereton *et al.* (2008) using data disaggregated at the individual and local level for Ireland obtained that climate has a significant influence on well-being. In particular, they suggested that wind speed affects negatively and increase in both January minimum temperature and July maximum temperature also increase life satisfaction. In addition, they also obtained that access to major transport routes and proximity to coast and waste facilities are relevant variables that influence well-being. More recently, Florida *et al.* (2010) using data from the 2009 Gallup - Healthways Survey in 184 US metropolitan areas found that the correlations are statistically non significant for January temperature and temperature stability while July temperature is negatively and significant related to metropolitan happiness.

In other studies, Welsch (2002, 2006) and Luechinger (2010) analyze the relationship between happiness and some pollution indicators. For example, Welsch (2006) using panel data for ten European countries finds that air pollution plays a statistically significant role as a predictor of intercountry and inter-temporal differences in

² Peiró (2001), Ateca *et al.* (2004) and, recently, Ahn and Mochón (2010) analyze the relationship between happiness and socioeconomic variables (unemployment, income, health and marital status among others)

subjective well-being. In a recent European study, Luechinger (2010) using data from the Eurobarometer, OECD and European Air Quality data base for the period 1979 – 1994 also obtained that air pollution affects negatively life satisfaction. In other recent contribution to the literature, Ferrer-i-Carbonell and Gowdy (2007) using data from the British Household Panel Survey from 1991 to 2003 found a significant negative correlation between well-being and concern about ozone pollution and a positive correlation between well-being and concern about species extinction.

In other recent paper, Zidanseck (2007) explored the relation between sustainable indicators and happiness. Using data from Environment Sustainability Index and Environmental Performance Index for 1990 and 2000, Zidanseck (2007) found a significant relationship between sustainability and happiness in both directions: people who are happier tend to care more about the environment and people who live in a better environment tend to be happier.

Following previous empirical studies that suggest a connection between environmental indicators and their impact on subjective well-being, in this paper we examine the importance of such relationship in the Spanish regions in year 2008.

3. Empirical Analysis: Data, Variables, Estimation and Results

For the empirical analysis of the Spanish case, we use three different data sources. First, we use the European Social Survey to obtain happiness data and most of the socio-economic factors affecting happiness (EES, www.europeansocialsurvey.org).³ The European Social Survey (EES) provides rich data on individuals' subjective well-being, political interests, trust, electoral participation, party allegiance, socio-political orientations, environmental attitudes and demographic and socio-economic characteristics required to control for individual heterogeneity (age, gender, education, employment status, marital status, number of children, income, etc.). Second, we also use GDP per capita and the unemployment rate data for each of the Spanish regions from Instituto Nacional de Estadística (INE, www.ine.es). Finally, we combine previous data with climate and air pollution data from Ministerio de Medio Ambiente y Medio Rural y Marino (AEMET, www.aemet.es).

in the Spanish case. The results they found regarding the relationship among these variables are in line with those obtained in this paper.

³ The ESS is a biennial multi-country survey covering over 30 nations. The first round was fielded in 2002/2003. Some papers that also used the ESS are Benesch *et al.* (2006), Caporale *et al.* (2009), Sironi and Menclarini (2009) and recently, Cunado and Perez de Gracia (2010) among others.

Table 1 summarizes all the data used in this paper. In this paper, we define different variables, some of them related with personal status (e.g., gender, age, income, subjective general health, marital status and main activity), the regional economic performance (e.g., GDP per capita, GDP growth rate and unemployment rate for each of the variables), others related with climate (e.g., average mean temperature, average main precipitation, relative humidity, number of rainy days, number of snowy days, number of foggy days, number of freeze days, number of sunny days and number of sun hours) and finally, pollution variables (e.g., nitrogen dioxide and phosphorus emissions).

TABLE 1. Description of the variables used

Variable name	Source	Description
Happiness	ESS	How happy are you, from 1 (not happy at all) to 10 (absolutely happy)
Satisfied with your life	ESS	How satisfied with life as a whole, from 1 (not satisfied at all) to 10 (absolutely satisfied)
Gender	ESS	Dummy variable which takes value 1 if the respondent is male, 0 otherwise
Age	ESS	Age of the respondent in years
Income	ESS	Subjective feeling about household's income nowadays: 1 (living comfortably on present income), 2 (coping on present income), 3 (difficult on present income), 4 (very difficult on present income)
Children	ESS	Dummy variable which takes value 1 if the respondent has children, 0 otherwise
Subjective general health	ESS	Discrete variable which takes the following values: 1 (Very good), 2 (good), 3 (fair), 4 (bad), 5 (very bad)
Marital status	ESS	Discrete variable which takes the following values: 1 (married); 2 (in a civil paternity); 3 (separated); 4 (divorced); 5 (widowed); 6 (never married, never in a civil paternity)
Main activity	ESS	Discrete variable which takes the following values: 1 (paid work); 2 (education); 3 (unemployed looking for a job); 4 (unemployed, not looking for a job); 5 (permanently sick or disabled); 6 (retired); 7 (housework and children)
Regions	ESS	Spanish region where the individual lives
GDP per capita	INE	Per capita GDP of each of the Spanish regions
Unemployment rate	INE	Unemployment rate for each of the Spanish regions
T	AEMET	Annually averaged mean temperature (°C)
Tmax	AEMET	Average mean temperature in hottest month (°C)
Tmin	AEMET	Average mean temperature in coldest month (°C)
R	AEMET	Regional averaged mean precipitation (mm)
H	AEMET	Regional relative humidity
DR	AEMET	Number of rainy days
DN	AEMET	Number of snowy days
DT	AEMET	Number of days in which it stormed
DF	AEMET	Number of foggy days
DH	AEMET	Number of freeze days
DD	AEMET	Number of sunny days
I	AEMET	Number of sun hours
Nitrogen	AEMET	Pollution by nitrogen dioxide (Tons/year)
Phosphorus	AEMET	Pollution by phosphorus (Tons/year)

Notes: ESS stands for European Social Survey (www.europeansocialsurvey.org); INE stands for Instituto Nacional de Estadística (www.ine.es) and AEMET stands for Agencia Estatal de Meteorología (www.aemet.es).

Table 2 includes the information on climate variables for each of the Spanish regions for 2008. The results show that Andalucía and Canary Islands present the

higher mean temperatures (with 18.6 and 21.6 °C respectively) while Castilla – Leon and Navarra present the lower temperatures in 2008 (with 12.8 and 12.5 °C respectively). When we observe the average mean precipitation, we detect that the Pais Vasco and Cantabria present the higher precipitation with 1195 and 1246 mm respectively while Murcia and Canary Islands present the lower precipitation with 301 and 214 mm respectively. Other relevant climate indicator is the number of sun hours per year which also present a higher variability with 2898 in the case of Andalucia and 1584 in the case of the Pais Vasco.

TABLE 2. Climate variables in Spanish regions, 2008 data

	T	Tmax	Tmin	R	H	DR	DN	DT	DF	DH	DD	I
Galicia	14.4	17.4	11.4	1008	77	131	0	16	37	0	48	1966
Principado de Asturias	13.2	16.8	9.6	1140	79	131	1	16	31	3	40	1702
Cantabria	14.1	18.1	10.2	1246	75	128	1	14	24	7	38	1638
País Vasco	14.3	19.1	9.4	1195	72	128	2	24	29	11	35	1584
Com. Foral de Navarra	12.5	17.8	7.1	721	68	95	10	23	17	42	58	2201
La Rioja	13.5	18.9	8.2	399	67	67	5	19	41	26	57	2242
Aragón	15	20.4	9.5	318	62	50	1	21	28	25	80	2614
Comunidad de Madrid	14.1	20.6	7.6	386	59	58	3	17	19	54	94	2658
Castilla y León	12.3	18.6	6.2	435	65	71	8	17	42	61	76	2534
Castilla- La Mancha	15.4	21.4	9.3	357	62	56	2	15	34	33	95	2847
Extremadura	16.6	23.3	9.9	463	66	61	0	13	38	21	106	2830
Cataluña	15.5	20	11.1	640	72	55	1	22	10	4	73	2524
Comunidad Valenciana	17.8	22.3	13.4	454	65	44	0	18	10	0	91	2660
Islas Baleares	16	22.1	10	410	73	51	0	16	36	19	69	2756
Andalucía	18.6	24.9	12.2	534	61	52	0	9	23	4	129	2898
Región de Murcia	17.8	24.4	11.2	301	59	35	0	11	17	11	94	2797
Canarias	21.2	24.3	18	214	63	31	0	2	0	0	93	2851

As in many studies in the literature, this paper uses individual's responses to the question: "How happy are you". The respondent answers on a scale from 1 to 10, where 1 stands for not happy at all and 10 for completely happy. This happiness measure is explained by means of using the following model

$$u_{i,k} = \alpha + \beta' \mathbf{x}_{i,k} + \gamma' \delta_k + \varepsilon_{i,k} \quad (1)$$

with $i = 1, \dots, I$, $k = 1, \dots, K$

where u is the answer to the happiness question, i represents the individual, k the Spanish region, x is a set of explanatory variables and δ is a set of environmental variables (*i.e.*, climate and pollution indicators). Equation (1) is estimated using an Ordered Logit model (see, for example, Maddala, 1983). Peiro (2006) and Cunado and Perez de Gracia (2010) among others also estimated the determinants of happiness using an Ordered Logit Model.

The estimation procedure is carried out in two different steps. In a first step, we present some descriptive data on happiness across the Spanish regions. As shown in Table 3, based on an ANOVA F test, we can reject the null hypothesis of no regional differences in happiness which suggest the region in which an individual lives may be a significant variable explaining his/her happiness or satisfaction level.

TABLE 3. Happiness in Spanish regions, 2008 data

	N	Mean	Std. Deviation	Minimum	Maximum
Galicia	499	7.41	1.61	2	10
Principado de Asturias	53	7.57	1.49	3	10
Cantabria	23	7.96	0.83	5	9
País Vasco	105	7.88	1.57	0	10
Comunidad Foral de Navarra	26	7.46	1.36	5	10
La Rioja	8	6.88	1.55	4	9
Aragón	50	7.72	1.37	4	10
Comunidad de Madrid	272	7.65	1.41	2	10
Castilla y León	114	7.14	1.40	2	10
Castilla- La Mancha	80	8.00	1.42	2	10
Extremadura	55	7.38	1.76	2	10
Cataluña	527	7.60	1.67	0	10
Comunidad Valenciana	181	7.69	1.47	2	10
Islas Baleares	43	7.44	1.28	5	10
Andalucía	402	8.10	1.88	0	10
Región de Murcia	60	7.43	1.69	2	10
Canarias	67	7.07	1.76	3	10
Total	2565	7.63	1.63	0	10
ANOVA F test for equal regional means= 4.703 (0.00)***					

Notes: N denotes number of observations. In the last row of the table, we show the statistic for the ANOVA F test for equal regional means. The statistic is 4.703, and the p-value is 0, so that, we can reject the null hypothesis of no regional differences at any significance level. ***

In a second step, we include individual socio-economic explanatory variables in the happiness equation. The main results obtained in this analysis are the following (see Table 4, Model 1):

- First, we find a significant effect of age on happiness. In fact, we find a non-linear effect of age on happiness: the negative effect of “age” and the positive effect of “age*age” indicates that happiness is U-shaped with age.
- Second, we do not find a significant effect of the “gender” variable on happiness. In former analysis, we find a low but significant (at a 10% significance level) effect of this variable. That is, women seem to be happier in average than men after controlling for the rest of explanatory factors. A similar result is also obtained by Castriota (2006).
- Third, one of the most significant variables on happiness is “subjective general health”. People who feel they have a very good, good or fair health are happier than those with bad health. Similar results are found by Berger and Leigh (1989), Veenhoven (1989,1991), Hartog and Oosterbeeck (1998) and Alesina *et al.* (2004).
- Fourth, “income” has also a positive significant and relevant effect on happiness. Similar result is also found by Veenhoven (1989).
- Fifth, “marital status” plays also a significant role on happiness: people who are married or in a civil partnership are happier than singles, while separated and widowed individuals are less happy than single ones (similar to Clark and Oswald, 1994; Blanchflower and Oswald, 2004b and Brereton *et al.*, 2008 among others).
- Sixth, the unemployment status has a negative and significant effect on happiness. While there are no significant differences among the variable which controls for professional activities, being unemployed and looking for a job is the unique negative and significant variable in this group of factors. A similar result is also found by Clark and Oswald (1994), Blanchflower and Oswald (2004a) and Winkleman (1998).
- Having children have also a positive significant effect on happiness.

- Finally, we find that, even after controlling for all the former socio-economic variables, there are still significant regional variables. For example, we still find higher happiness indexes in some regions such as Andalusia, Castilla - La Mancha, Comunidad Valenciana and Cataluña, and lower indexes for La Rioja or Canarias. This is a key conclusion of this paper, since it indicates that socio-economic variables are not enough for explaining differences in happiness. The rest of the paper tries to explain these regional differences in happiness. The results presented in Model 2 (Table 4) indicate that these regional variables cannot be explained by the usual macroeconomic regional variables such as per capita GDP, its growth rate and regional unemployment rate. In fact, when we include both macroeconomic and environmental variables in the same equation, we observe that these last variables explain differences in happiness among regions better than the macroeconomic variables.

When we estimate the happiness equation including individual socio-economic variables, regional economic variables and climate and pollution variables using an ordinal logit model, the main results are the following (see Table 4, model 3). The results are the following:

- Due to the high correlation coefficient among regional temperature variables (average, maximum and minimum temperatures), we only include as explanatory variable the average temperature, which plays a significant and negative effect on individual happiness. That is, people living in regions with high temperature are not as happy as those living in other regions.
- Other climate variables, different from temperature, play additional roles in explaining happiness. For example, regional rain precipitation has a positive significant effect on individual happiness. A similar result is found by Brereton *et al.* (2008). For the Irish case they interpreted the results as follows: an increased rainfall slightly increases life satisfaction. Furthermore, the results suggest that humidity and number of freeze days have a negative impact on happiness. Finally, the number of sun hours has a positive effect on individual happiness.

TABLE 4. Ordinal Logit estimation

		Model 1	Model 2	Model 3
Age		-0.074 (26.5)***	-0.074 (26.56)***	-0.074 (26.70)***
Age2		0.001 (18.33)***	0.001 (18.45)***	0.001 (18.57)***
Gender	Male			
	Female	-0.132 (2.66)	-0.13 (2.66)	-0.138 (2.92)*
Health	Very good	2.66 (46.36)***	2.67 (46.88)***	2.71 (48.05)***
	Good	1.83 (23.02)***	1.84 (23.30)***	1.87 (24.11)***
	Fair	1.39 (13.44)***	1.40 (13.67)***	1.43 (14.25)***
	Bad	0.835 (4.76) **	0.85 (4.89)**	0.87 (5.13)**
	Very bad			
Income	Comfortable	1.55 (57.76)***	1.55 (57.74)***	1.53 (56.48)***
	Quite comfortable	1.09 (31.16)***	1.09 (31.27)***	1.07 (30.35)***
	Difficult	0.366 (3.28)*	0.37 (3.34)*	0.34 (2.86)*
	Very difficult			
Marital status	Married	0.69 (28.43)***	0.69 (28.56)***	0.69 (28.60)***
	Civil paternity	0.575 (6.24)**	0.58 (6.26)***	0.57 (6.10)**
	Separated	-0.563 (3.09)*	-0.56 (3.05)*	-0.56 (3.06)*
	Divorced	-0.17 (0.10)	-0.16 (0.09)	-0.175 (0.10)
	Widowed	-0.45 (4.29)**	-0.45 (4.30)*	-0.46 (4.45)**
	Never married, never civil paternity			
Main activity	Paid work	-0.039 (0.082)	-0.04 (0.09)	-0.033 (0.06)
	Education	0.080 (0.131)	0.08 (0.13)	0.066 (0.09)
	Unemployed, looking	-0.71 (10.65)***	-0.72 (10.93)***	-0.71 (10.81)***
	Unemployed, not looking	0.282 (0.94)	0.27 (0.86)	0.282 (0.943)
	Sick, disabled	0.025 (0.01)	0.02 (0.01)	0.030 (0.01)
	Retired	0.253 (2.94)*	0.25 (2.90)*	0.258 (3.07)*
	Housework, children			
Children	Yes			
	No	0.226 (5.96)**	0.22 (5.83)**	0.222 (5.81)**
Region	Galicia	0.244 (1.03)		
	P. de Asturias	0.329 (0.94)		
	Cantabria	0.415 (0.89)		
	País Vasco	0.508 (3.04)*		
	Com. Foral Navarra	0.137 (0.10)		
	La Rioja	0.137 (0.04)		
	Aragón	0.436 (1.61)		
	C. de Madrid	0.259 (1.05)		
	Castilla y León	-0.201 (0.51)		
	Castilla La Mancha	0.795 (6.60)***		
	Extremadura	0.094 (0.08)		
	Cataluña	0.506 (4.45)**		
	Com. Valenciana	0.552 (4.38)**		
	Islas Baleares	0.217 (0.37)		
	Andalucía	1.144 (21.68)***		
	Región de Murcia	0.338 (1.08)		
	Canarias			
Macroeconomic regional variables	Per capita GDP		0.00 (0.04)	
	Unemployment rate		0.02 (0.07)	
	Per capita GDP growth		-0.03 (0.02)	
Climate variables	T		-0.24 (2.45)	-0.172 (5.01)**
	Tmax			
	Tmin			
	R		0.004 (4.84)***	0.002 (11.89)***
	H		-0.18 (11.66)***	-0.086 (15.30)***
	DR		-0.002 (1.03)	-0.006 (2.84)*
	DN			
	DT			
	DF			
	DH		-0.033 (5.66)**	-0.024 (7.31)***
	DD		-0.023 (2.19)	
	I		0.003 (4.87)**	0.001 (5.00)**
Pollution variables	Nitrogen			
	Phosphorus		-0.37 (1.22)	-0.282 (2.58)**
Pseudo-R ²		0.251	0.250	0.249

Notes: *, ** and *** indicate significant at 10, 5 and 1% level.

- As far as air pollution variables are concerned, the two variables we use in this paper are correlated (the correlation coefficient is 0.86), so that, we include in model 3 one of them, obtaining a significant and negative effect on individual happiness. That is, the results suggest that people living in more polluted areas report lower happiness indexes than those living in less polluted areas. This result is similar to that of Welsch (2002, 2006 and 2007) and Luechinger (2010) who find that air pollution variables present a negative and significant impact on individual level of happiness.

4. Concluding Remarks

In this paper we analyze regional differences in happiness across Spanish regions using data for 2008 from the European Social Survey Database, Instituto Nacional de Estadística and Ministerio de Medio Ambiente y Medio Rural y Marino, and by means of estimating different Ordinal Logit Models. A first look at the data shows significant differences among Spanish regions. For example, Andalucía and Castilla - La Mancha are the regions which present the highest happiness average index, while La Rioja, Canarias and Castilla-Leon present the lowest indexes.

When we include individual socio-economic variables in the happiness equation, we still find significant regional differences in happiness, which implies that individual happiness also depends on geographical or regional variables. In order to account for these variables, we include in the happiness equation regional economic, climate and pollution variables.

The most relevant results obtained in this paper are the following. Climate and air pollution variables affect happiness more than other regional macroeconomic variables, such as regional GDP or unemployment rate. In fact, the average temperature of the region has a negative impact on individual happiness, while average rain precipitation has a positive effect on this variable. Furthermore, people who live in a region with higher number of sun hours seem happier, while those who live in a region with a higher relative humidity are less happy. In this paper, the pollution variables are proxied by nitrogen dioxide and phosphorus emissions. Pollution

variables affect in a significant negative way on individual happiness. Finally, and as expected, we find several individual explanatory variables with a positive and significant effect on happiness, such as age, health, income, married people and significant and negative of the unemployment and separated or widowed people.

We believe that the results obtained in this paper may help designing public policies in order to affect individual happiness at regional level. For example, it seems than policies directed to control the pollution may have positive effects on individual happiness and subjective well-being.

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