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Analysis of Households Features, Consumption Patterns and CO_2 Emissions for Spain in an Input-Output framework.

Duarte Pac, Rosa; Mainar Causapé, Alfredo*; Sánchez-Chóliz, Julio

Department of Economic Analysis. University of Zaragoza (Spain)
Gran Vía, 2. 50005. Zaragoza. Spain.
Phone +34 976 762925. Fax +34 976 761996
E-mail:rduarte@unizar.es;alfredo@unizar.es; jsanchez@unizar.es

*Corresponding author

Abstract

Previous works have looked at the relationship between the behaviour and, in particular, the consumption patterns of households and CO_2 emissions resulting from production in Spain. The aim of this paper is to analyse the factors underlying the composition of final demand and, therefore, determining the final volume of emissions. This study will allow us to identify more clearly the relationships between the different parameters characterising Spanish households and their behaviour with regard to consumption and the demand for goods and services, and on this basis to propose measures to change consumption patterns towards standards that are better aligned with sustainable growth and development. The methodology proposed for this study combines linear Input-Output and SAM models, and includes segmentation of variables and the use of econometric tools.

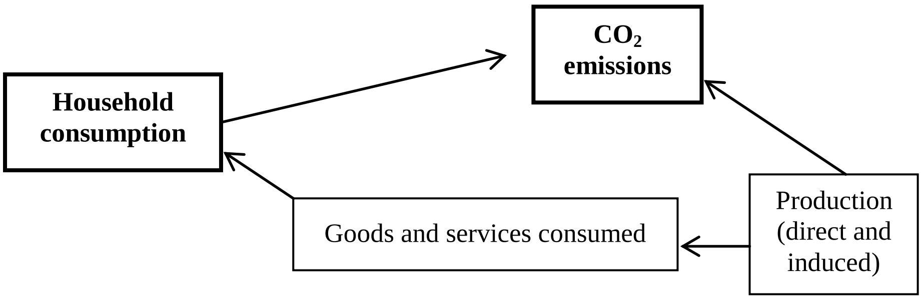
Keywords: Consumption patters, income distribution, environmental impact, Social Accounting Matrix for Spain, linear SAM models

1. Introduction

That there is a relationship between the economy and the environment and, in particular, between pollution and environmental degradation is obvious. Meanwhile, the economic activities of individuals and organisations involves not only choices about what to produce and how, but also implicit decisions about the resources used. However, the use of resources and the related production technologies are also linked to the problem of pollution in the form of greenhouse gas emissions, the discharge of waste water and the generation of solid waste. In this context, this paper proposes an economic analysis of the problem of pollution (focusing on the representative issue of CO_2 emissions) from the standpoint of the impact attributable to household spending and consumption patterns.

One of the bases for this analysis is, therefore, the relationship between consumption and production, since *"Consumption is the only end and purpose of production,"* as Adam Smith famously remarked in *The Wealth of Nations* (Smith, 1776). Goods and services are produced to meet the needs of individuals, households and organisations, in other words to be consumed. Consequently, the manufacture of one or other good, or the provision of services and, in the final analysis, all of the production inputs required are directly linked with the needs expressed by the end consumers, whether they are viewed as individuals, standardised consumption units, households or any other kind of institution, and even investment can be considered as just another component of intermediate demand. Since this output pollutes the environment, together with final, direct consumption of pollutants, a relationship can be established between consumption and pollution (in this study, CO_2 emissions) as shown in Diagram 1. This provides a limited approximation to the *ecological footprint*[1] indicator first developed by Wackernagel and Rees (Wackernagel and Rees, 1996). [2]

Diagram 1. Links between CO_2 emissions and household consumption



If our aim is to establish the possible impact of household consumption patterns on the total generation of emissions in an economy, we will need to consider the possibility that these patterns may vary between households depending on their levels of income, as regards both the implicit formation of spending propensities and the distribution of expenditure on goods and services. Consequently, the analysis cannot be confined merely to the actual situation, and some examination of the effects that could arise from fictitious situations is required. For example, we could consider changes in the distribution of income, in order to isolate and analyse the specific effects produced by differing demand structures and their interaction with the economy in general and the

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[1] Basically, the concept of the ecological footprint means converting the generation of waste by the inhabitants of a given area into a single unit of measure (land). However, the reality this is intended to reflect is the impact of economic activity on the environment, which is not uniform for all of the different types of pollution that could be considered, since each one (waste water, greenhouse gases, CO_2, etc.) is linked to varying economic behaviours or, to put this another way, to the structure of consumption in different types of households. Consequently, it is necessary to consider the ecological footprint in a wider sense and not to focus on a single unit of measurement, but to measure the phenomenon for different kinds of pollutants affecting both water, as in the present case, and the air.

[2] Around 50 papers have been published in leading journals on the basis of this definition, including applications to different situations and countries (Wackernagel and Rees, 1996; Bicknell et al., 1998; Wackernagel et al., 1999; Loh, 2000; and Ferng 2001 and 2002).

productive sector in particular, separating these effects from those produced by the higher or lower level of the annual income available to households.

Linear SAM (Social Accounting Matrices) are used to measures and assess these effects. Input-output techniques and linear SAM models are used because they reflect the interrelationships existing between all sectors of the economy, whether productive or institutional, which means they reveal the total effect of a change in demand and not simply the impact on direct production of the good or service concerned. These techniques thus reflect all of the effects of the chain of intermediate interactions and demands linking all of the endogenous sectors of the economy. The literature in fact already contains a number of papers relating the study of the environmental effects of consumers' economic behaviour with the use of the input-output methodology as systematic calculation tools (Bicknell et al., 1998; Ferng, 2002; Hubacek and Giljum, 2003; and McDonald and Patterson, 2004). In this light, the use of this concept, or rather its direct successor, the social accounting matrix (Sánchez-Chóliz and Duarte, 2004) is all the more interesting.

The objective of this paper, then, will be to relate households, classified on the basis of their socio-demographic and economic characteristics, with the pollution they generate, taking the structure of their consumption as the causal variable. The structure of the presentation is as follows: section 2 describes the methodology applied, and section 3 presents the key results obtained from our research. Finally, we set out our main conclusions in section 4, and we include an appendix containing an aggregate version of the SAM Spain-99 used and additional data tables.

2. Methodology

This analysis of the possible relationship between household consumption patters and the generation of CO_2 begins with the application of linear SAM models. The model used as the principal data base here is the 1999 Social Accounting Matrix for Spain constructed on the basis of the usual methodology (Mainar and Flores, 2004). Specifically, the aggregate summary of the SAM used is as follows:

Diagram 2. Simplified structure of the SAM Spain -1999

	Productive activities	External sector	Factors	Companies and Gov.	Saving / Investment	Households	Total
Productive activities	X_{11}	X_{12}	0	X_{14}	X_{15}	X_{16}	x_1
External sector	X_{21}	0	X_{23}	X_{24}	X_{25}	X_{26}	x_2
Factors	X_{31}	X_{32}	0	0	0	0	x_3
Companies and Gov.	X_{41}	X_{42}	X_{43}	X_{44}	0	X_{46}	x_4
Saving / Investment	0	0	0	X_{54}	0	X_{56}	x_5
Households	0	X_{62}	X_{63}	X_{64}	0	X_{66}	x_6
Total	x_1	x_2	x_3	x_4	x_5	x_6	

These models, which are similar to those described in the literature concerning the input-output framework, require the existence of at least one exogenous sector or institution. Since the objective in this case is to analyse CO_2 emissions based on consumption patters, total household consumption is taken as the exogenous variable, resulting in the following model, where **x** is the vector of total output by sectors, **y** is the vector of final household demand (exogenous variable), and **A** is the matrix of the SAM coefficients:

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \begin{bmatrix} A_{11} & A_{12} & 0 & A_{14} & A_{15} \\ A_{21} & 0 & A_{23} & A_{24} & A_{25} \\ A_{31} & A_{33} & 0 & 0 & 0 \\ A_{41} & A_{42} & A_{43} & A_{44} & 0 \\ 0 & 0 & 0 & A_{54} & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} + \begin{bmatrix} X_{16} \\ X_{26} \\ X_{36} \\ X_{46} \\ X_{56} \end{bmatrix} \Leftrightarrow x = Ax + y$$

This can be expressed as follows, where **M** is the matrix of linear multipliers:

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \begin{bmatrix} M_{11} & M_{12} & M_{13} & M_{14} & M_{15} \\ M_{21} & M_{22} & M_{23} & M_{24} & M_{25} \\ M_{31} & M_{32} & M_{33} & M_{34} & M_{35} \\ M_{41} & M_{42} & M_{43} & M_{44} & M_{45} \\ M_{51} & M_{52} & M_{53} & M_{54} & M_{55} \end{bmatrix} \begin{bmatrix} X_{16} \\ X_{26} \\ X_{36} \\ X_{46} \\ X_{56} \end{bmatrix} \Leftrightarrow x = (I - A)^{-1} y = My$$

For this model to reflect the pollution generated by households, it will be necessary to utilise a pollution vector, ***c***, such that the specific pollution values per unit of output will be $\Lambda = (\lambda_i) = c'M$, while the pollution caused by household demand will be ***c'My***, where λ_i, calculated as $\lambda_i = \sum_r c_r m_{r,i}$, is the direct and indirect pollution inevitably generated for each monetary unit of expenditure by households in sector **i**, while **c´y** would indicate exclusively the direct pollution related with consumption (Sánchez-Chóliz, Duarte and Mainar, 2006).

In order to analyse whether the existence of varying consumption patterns for different types of household is a determining factor for the generation of more or less CO_2 emissions by the productive sectors and institutional agents (i.e. for the economy as a whole), it is necessary to classify households on the basis of a series of socio-demographic and economic variables. For this purpose, we use information obtained from the *Encuesta Continua de Presupuestos Familiares 1999* (Continuous Family Budgets Survey 1999 –ECPF 1999) prepared by the Spanish National Statistics Institute (INE). The data contained in the survey were used to classify households as belonging to the social strata indicated below, and the resulting expenditure structures were used as the basis to obtain the related consumption patterns.

3. Results

Starting from the SAM Spain-99 and the pollution vectors initially estimated based on the INE data, the linear SAM model described above was applied to obtain the specific pollution variables (in this case CO_2 emissions) per unit of output demanded.

INSERT TABLE 1

Having obtained the vector of CO_2 emission values related with the vertically integrated effects of the demand for goods and services from Spanish households, we can now use the distribution of household expenditure to obtain the volume of emissions caused by each of the social strata, classified on the basis of the segmentation variables, as a result of their consumption behaviour.

3.1. Average emissions, and socio-demographic and income factors

Applying the methodology described above, we obtain both the per capita emissions (caused by household consumption) and emissions per unit of consumption (based on the modified OECD scale), not only for the Spanish economy as a whole, but also broken down by the social strata to which households belong using segmentation criteria based on socio-demographic variables referring basically to two factors: geographical place of residence (region, population density in the area, urban or rural population centre) and social status or income level of households (social class and monthly income).

The following charts present the per capita scores for each of the segments considered (values per capita and per unit of consumption are shown in the appendix, together with a table presenting the distribution of demand, CO_2 emissions, households and individuals for each criterion based on the sample utilised in the ECPF 1999 survey).

As may be observed, 7.42 tons of per capita CO_2 emissions were generated directly and indirectly as a result of consumption by Spanish households (11.76 tons per unit of consumption). The regions with the highest pollution values (for household consumption) were Catalonia (8.95 metric tons), Madrid (8.66 tons) and the Basque Country (8.47 tons). High scores were also obtained for the Balearic Islands (8.18 tons), Cantabria (8.15 tons) and Navarre (8.14 tons). All of these regions, together with Aragon (7.89 tons), were above the national average. The regions with the lowest levels of per capita emissions were Castile-La Mancha (6.35 tons), the Canary Islands (6.20 tons), Andalusia (6.17 tons) and, at the bottom, Extremadura with less than 5 tons per head.

Significantly, the ranking of the regions above and below the national average is almost exactly the same as the segmentation of the self-governing Autonomous Communities of Spain by per capita GDP in 1999 (except for Cantabria and La Rioja). This is a reflection of the relationship between income and emissions, since the “richest” regions generate relatively higher CO_2 emissions.

INSERT CHART 1

The above values do not, however, always indicate a pattern of consumption involving higher pollution in the regions concerned. By simulating identical spending by all of the households in the sample, we may observe (at least approximately) the role of the different expenditure patterns in the generation of emissions for each of the regions considered. This experiment reveals that the Balearic Islands (9.39 tons) is the region with the dirtiest consumption pattern if spending is distributed equally over all Spanish households, followed by Aragon (8.62 tons), Castile and León (8.54 tons) and Catalonia (8.52 tons). The other regions placed above the national average (7.82 tons per capita after the equalisation of household expenditure) are Madrid, Navarre, La Rioja and Asturias. Meanwhile, the regions with the cleanest consumption patterns are Murcia, Andalusia and Cantabria, with emissions per capita close to 7 metric tons.

INSERT CHART 2

Let us now turn to the other geographical and location characteristics of households. The 1999 data show higher levels of CO_2 emissions (associated with household consumption) in urban areas with a score of 7.68 tons per capita compared to 6.59 tons for rural areas, and higher values for more densely populated areas (8.16 tons for high density, 7.02 tons for medium density and 6.5 for sparse density areas). However, the equal expenditure simulation reveals that these differences are basically linked to greater total household demand in large towns and cities, since the resulting emissions are practically identical for urban and rural residents. In terms of population density, differences attributable to consumption patterns may be observed, although no direct correlation between density and pollution is apparent.

INSERT CHART 3

Analysis of the relationship between household consumption patterns and CO_2 emissions also usually take income as a benchmark. As mentioned above in relation to the estimates by region, the observation of an increasing relationship between income and emissions initially suggests that rising wealth entails dirtier consumption patterns. This relationship is clearly apparent in the analysis by social classes and income levels, as may be seen in the following chart:

INSERT CHART 4

The correlation between social class or income level and pollution is clear. In terms of the former, upper class households generated no less than 11.72 metric tons of CO_2 per capita, while the emissions produced by lower class individuals are below 6 tons (5.57). Where the benchmark is income, meanwhile, per capita emissions grow relentlessly the higher the income band, rising from 5.27 metric tons in the lowest income band to 12.83 tons accounted for by the upper income band.

Once again, however, the initial picture is misleading. If we assume equal distribution of expenditure for 1999 across all households, the trends described are inverted, totally so in the case of income. Considering this segmentation variable for all households (now with identical spending levels), we find that per capita emissions in fact decrease the higher the income band (this situation is practically identical considering social class, although the emissions produced by upper class households are lower only than those of lower class households).

INSERT CHART 5

3.2. CO_2 emissions and sensitivity to spending

In light of the above, consumption patterns at higher levels of income are in fact less dirty than in lower income households, suggesting that pollution will be less per unit of expenditure at higher income levels (even if the total value of expenditure means effective pollution is greater).

To test this hypothesis, we estimated the elasticity of CO_2 in terms of total household expenditure. The value of this elasticity for the total national sample is 0.84. Hence, increases in household spending generate a less than proportional rise in CO_2 emissions. This result corroborates the hypothesis that consumption patterns are cleaner in households with higher income, and therefore spending (although actual per capita pollution is higher due to the increase in expenditure, because wealthier households apply a smaller proportion of their income to consumption and more to taxation, savings and so on, which offsets the effect).

In any event, the pollution elasticity referred to above varies depending on the household stratum for which it is calculated, revealing different sensitivities to the generation of CO_2 emissions by households based on expenditure for the population segment considered. The lowest elasticities are found in the strata where the reduction in emissions (relative to spending) is greater in the presence of increases in expenditure due to the consumption pattern. For example, emissions in the lowest income stratum increased by only 77.5% of the proportional rise in expenditure for households with the highest spending, but in the highest income stratum the increase was 90.7% of the increase in spending. Hence, the low income stratum is “more sensitive” than the high income stratum in terms of the reduction in emissions (relative to spending due to the consumption pattern) when expenditure increases.

INSERT TABLE 2

4. Conclusions

The distribution based on socio-demographic variables of CO_2 emissions caused directly or indirectly by household consumption in Spain is a consequence of multiple factors. However, the existence of cleaner or dirtier consumption patterns in each of the social strata cannot be extrapolated or affirmed through direct observation of the average emissions (whether per capita or per unit of consumption). By simulating equal distribution of expenditure by all households, however, the true effect of consumption patterns is revealed, and the trends displayed are sometimes contrary to those initially observed. The case of income is the most significant. The equalisation exercise shows, despite the evidence of the real data, that higher income households have cleaner consumption patterns, although their higher total spending means they generate more CO_2.

This inverse relationship between income and pollution due to consumption patterns was verified by calculating the elasticity of CO_2 emissions and total household spending (discounting the household size effect). Thus, rising expenditure entails a less than proportional increase in emissions, and the size of the relationship depends on the social stratum considered.

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Table 1. Pollution values. CO_2 emissions (thousands of tons) per million euros of household demand. Spain, 1999

Agriculture, forestry and aquiculture	0.99	**Rubber, plastics and other manufactures**	0.87
Energy Products	5.36	**Construction and engineering**	0.79
Water utilities	0.87	**Recoveries and repairs**	1.02
Minerals and metals	1.32	**Retailing**	0.44
Minerals and non-metal products	2.88	**Catering and Restaurants**	0.52
Chemicals	1.18	**Transport and communications**	**3.34**
Metal products and machinery	1.11	**Banking and insurance**	0.31
Automotive manufacturing	1.00	**Real estate activities**	0.35
Food products, beverages and tobacco	0.96	**Education (private and public)**	0.22
Textiles, leather and footwear	0.94	**Health (private and public)**	0.34
Paper, stationery and printing	0.83	**Government and other services**	0.41
Wood, cork and wooden furniture	0.82		

Table 2. Elasticity[3] of CO_2 emissions (generated by household consumption) to spending. 1999

TOTAL: *0.838*

Region	Andalusia	0.811
	Aragon	0.753
	Asturias	0.825
	Balearic Islands	0.746
	Canary Islands	0.766
	Cantabria	0.787
	Castile-León	0.770
	Castile-La Mancha	0.796
	Catalonia	0.764
	Valencia	0.807
	Extremadura	0.802
	Galicia	0.786
	Madrid	0.767
	Murcia	0.790
	Navarre	0.775
	Basque Country	0.815
	La Rioja	0.733
	Ceuta and Melilla	0.808
Urban / Rural	Urban	0.841
	Rural	0.845
Density	Densely populated	0.848
	Medium density	0.823
	Sparsely populated	0.846

Social class	Upper	0.858
	Upper-Middle	0.846
	Lower-Middle	0.841
	Lower	0.818
Monthly household income (euros)	Up to EUR 390.6	0.775
	EUR 390.7 to 781.3	0.797
	EUR 781.4 to 1,171.9	0.837
	EUR 1,172.0 to 1,562.6	0.839
	EUR 1,562.7 to 1,953.2	0.896
	EUR 1,953.3 to 2,343.9	0.884
	EUR 2,344.0 to 3,906.5	0.880
	Over EUR 3,906.6	0.907

[3] The elasticity, ε, was obtained using the following regression:

$$CO_2 = A * g^{\varepsilon} * \exp(B * below14 + C * over14)$$

where g is total household spending, *below14* is the number of household members below 14 years of age, and *over14* is the number of members aged over 14 (Weber and Matthews, 2008).
The R^2 obtained from the regressions were around 0.9 in all cases.

Chart 1. Per capita CO_2 emissions (attributable to household consumption). 1999.

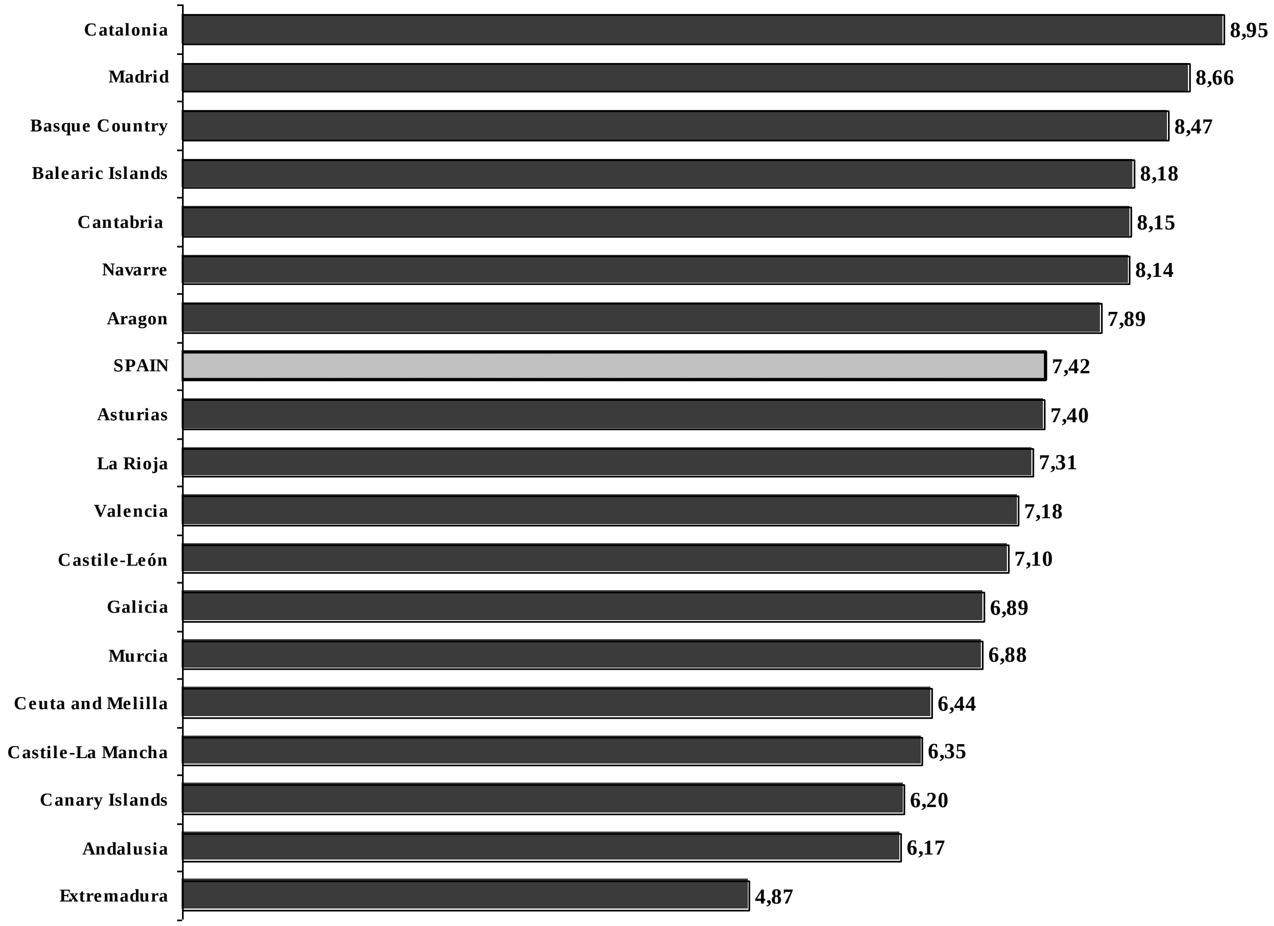


Chart 2. Per capita CO2 emissions (attributable to household consumption) assuming equal distribution of spending by all households nationwide. 1999

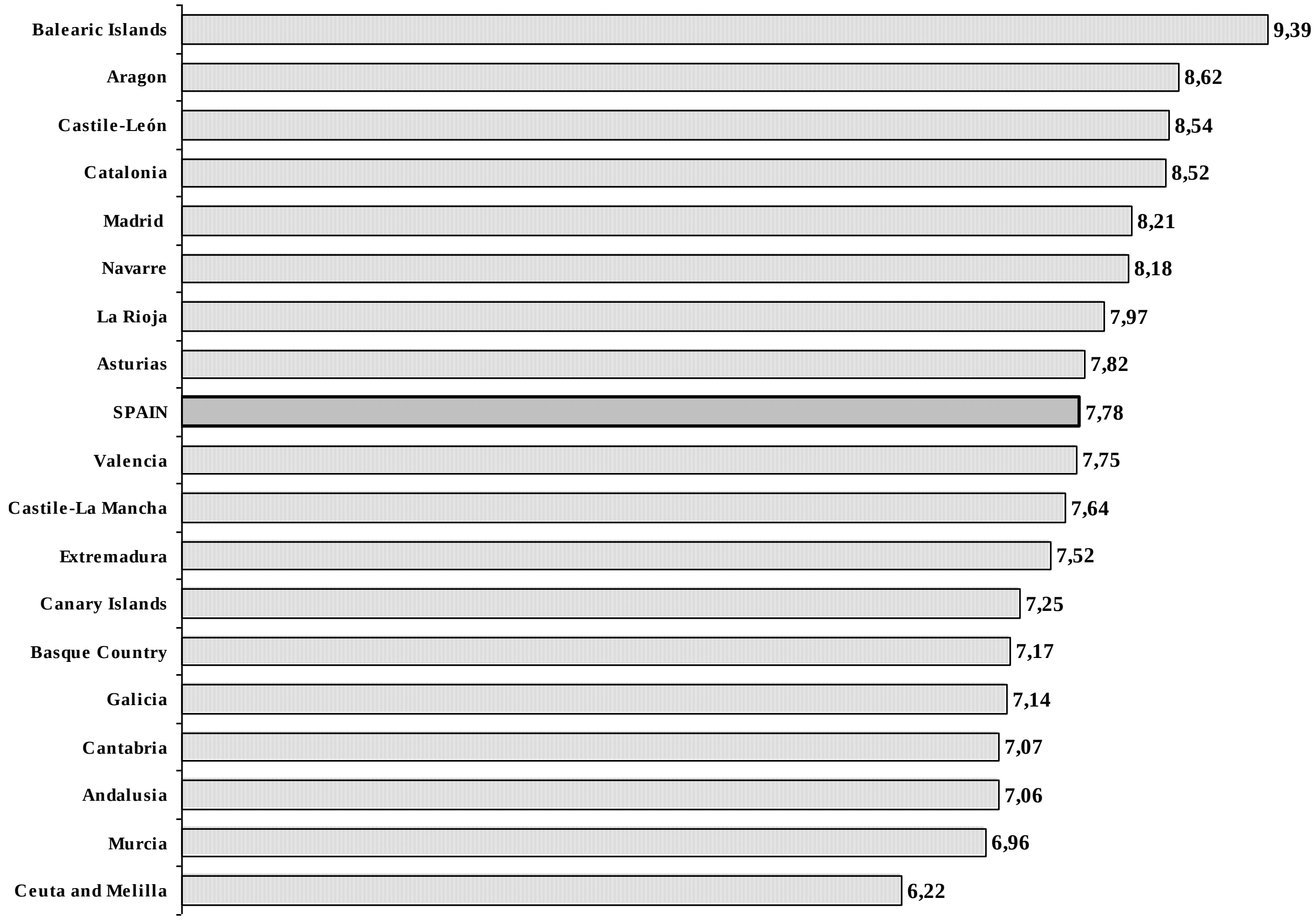


Chart 3. Per capita CO2 emissions (attributable to household consumption). Actual data and data assuming equal distribution of expenditure by all households nationwide. 1999

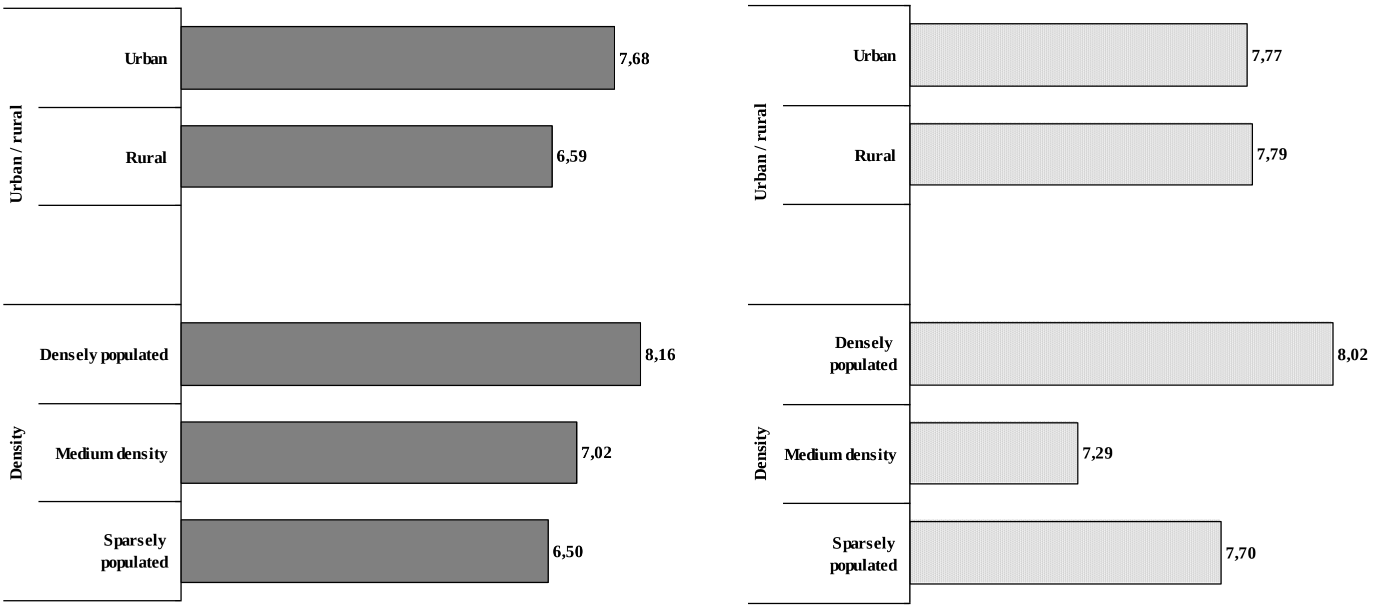


Chart 4. Per capita CO2 emissions (attributable to household consumption)

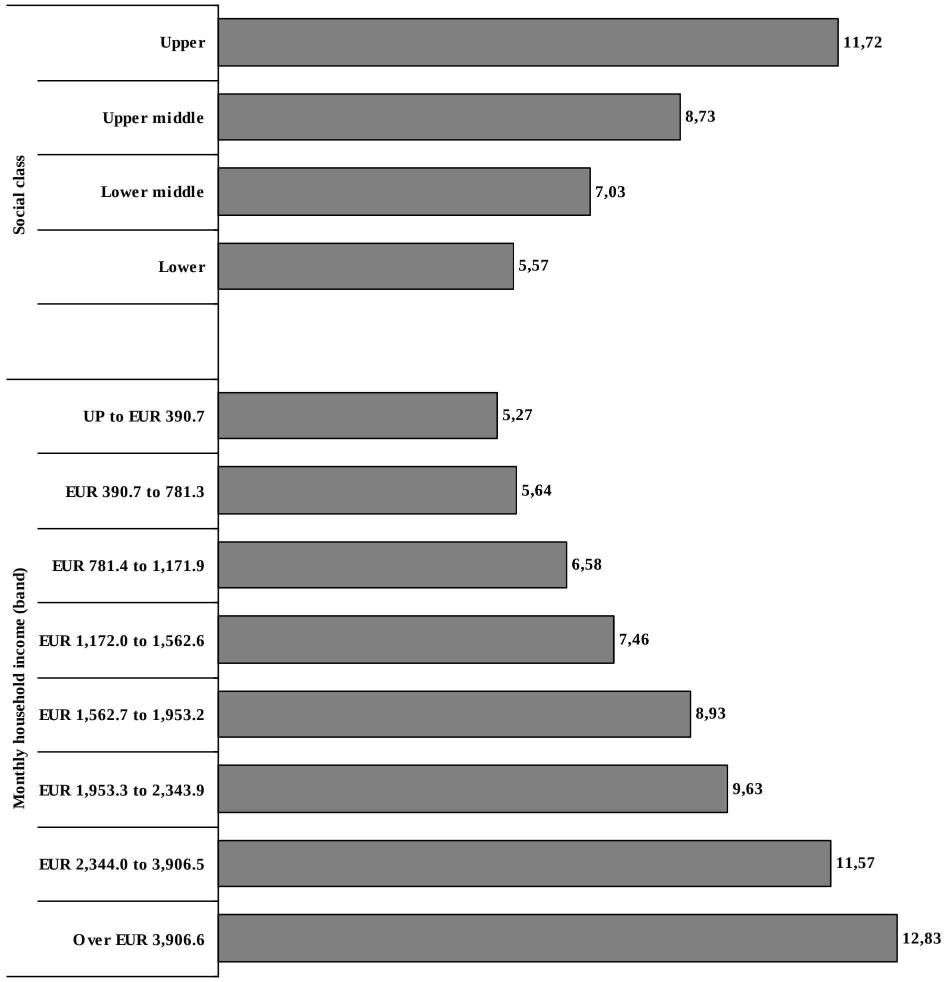
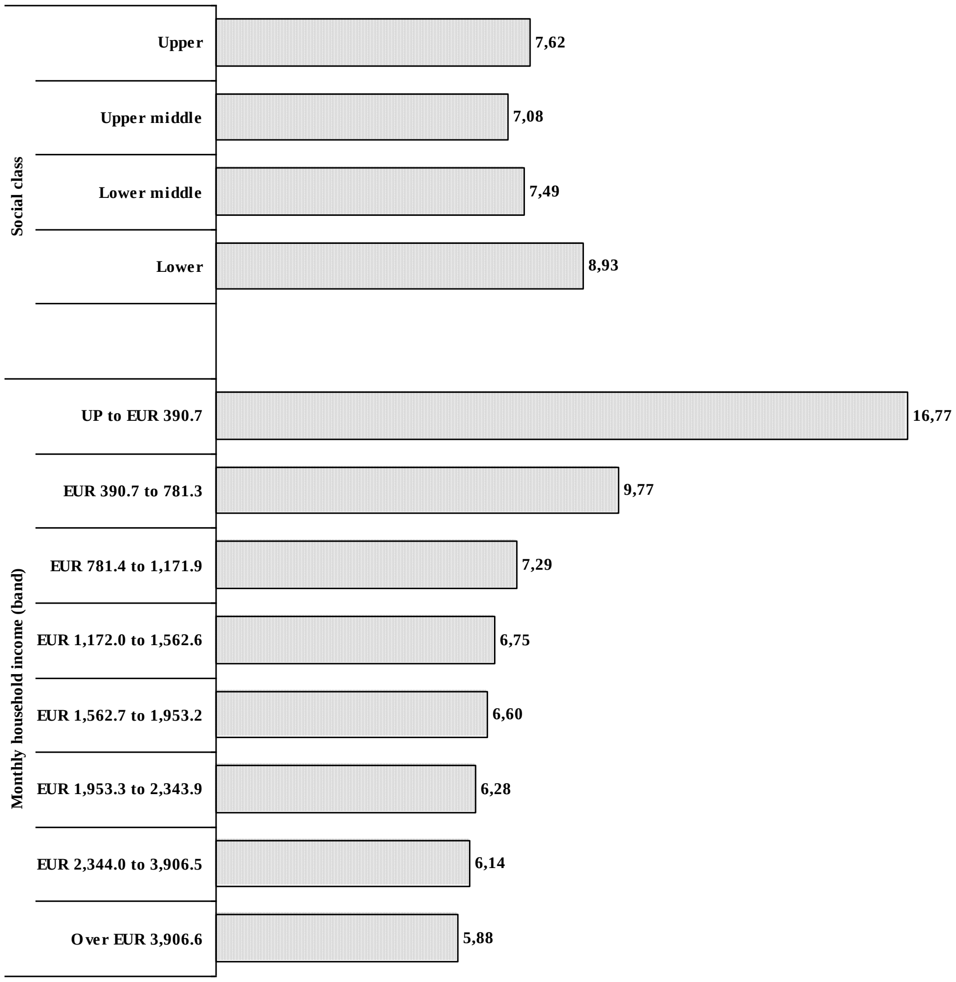


Chart 5. Per capita CO2 emissions (attributable to household consumption) assuming equal distribution of spending by all households nationwide. 1999.



Appendix

Social Accounting Matrix for Spain, 1999 (aggregate accounts) (millions of euros)

	Account 1	**Account 2**	**Account 3**	**Account 4**	**Account 5**	**Account 6**	**Account 7**	**European Union**	**Rest of world**	**Labour**	**Capital**	**Companies**	**Govern-ment**	**Saving / Investment**	**Households**	**Total**
Account 1	38,862	20	457	11	1,724	329	16,508	16,127	3,754	0	0	0	0	906	38,724	117,423
Account 2	2,939	16,709	2,697	5,589	1,085	13,987	11,162	5,095	3,134	0	0	0	0	343	11,000	73,741
Account 3	4,116	1,205	16,306	9,286	3,174	2,358	6,212	13,164	5,158	0	0	0	1,173	3,915	12,076	78,144
Account 4	2,097	3,224	2,593	50,579	1,812	9,429	10,079	50,949	15,287	0	0	0	34	39,325	18,715	204,122
Account 5	2,258	955	2,207	2,175	18,724	2,600	9,693	8,391	3,596	0	0	0	0	446	17,850	68,894
Account 6	212	412	126	432	168	13,533	13,188	4	4	0	0	0	0	72,368	2,416	102,864
Account 7	15,033	10,742	10,554	22,715	8,941	15,840	122,739	20,747	10,135	0	0	0	97,378	21,645	234,204	590,673
European Union	9,840	3,658	18,473	56,598	8,961	8	11,172	0	0	265	0	15,122	6,081	-1,528	2,155	130,806
Rest of world	8,083	10,341	5,811	17,087	5,174	12	7,429	0	0	340	0	3,099	1,510	-10,207	985	49,664
Labour	12,315	9,005	11,302	25,956	12,549	27,562	184,297	302	275	0	0	0	0	0	0	283,563
Capital	22,690	14,867	5,363	10,202	5,109	12,436	154,400			0	0	0	0	0	0	225,067
Companies	0	0	0	0	0	0	0	8,296	5,454	0	97,742	39,248	14,922	0	29,873	195,535
Government	-1,023	2,602	2,256	3,493	1,473	4,770	43,795	4,299	210	0	8,383	23,974	62,793	0	117,136	274,161
Saving / Investment	0	0	0	0	0		0	0	0	0	0	69,155	16,121	0	41,937	127,213
Households	0	0	0	0	0	0	0	3,432	2,655	282,958	118,942	44,937	74,148	0	20,817	547,890
Total	117,423	73,741	78,144	204,122	68,894	102,864	590,673	130,806	49,664	283,563	225,067	195,535	274,161	127,213	547,890	1,833,899

Account 1: Agriculture and food; **Account 2:** Energy and extractive industries; **Account 3:** Chemicals, rubber and plastics; **Account 4:** Metal products, machinery and transport materiel; **Account 5:** Other manufactures; **Account 6:** Construction; **Account 7:** Services.

Distribution of CO_2 emissions in final demand (households), and by number of households, per head and per unit of consumption (modified OECD scale). 1999

	Emissions	Demand	Households	Population	Units of consumption
Region					
Andalusia	15.3%	15.0%	17.3%	18.3%	17.9%
Aragon	3.2%	3.1%	3.1%	3.0%	3.0%
Asturias	2.7%	2.6%	2.8%	2.7%	2.7%
Balearic Islands	2.1%	2.1%	2.1%	1.9%	1.9%
Canary Islands	3.4%	3.4%	3.8%	4.1%	4.0%
Cantabria	1.5%	1.4%	1.3%	1.3%	1.3%
Castile-León	6.0%	5.8%	6.7%	6.3%	6.4%
Castile-La Mancha	3.7%	3.4%	4.2%	4.3%	4.3%
Catalonia	18.5%	19.5%	16.4%	15.4%	15.6%
Valencia	9.7%	9.6%	10.3%	10.0%	10.1%
Extremadura	1.8%	1.7%	2.8%	2.7%	2.7%
Galicia	6.4%	6.4%	6.6%	6.9%	6.8%
Madrid	14.9%	15.2%	12.7%	12.8%	12.8%
Murcia	2.6%	2.6%	2.7%	2.8%	2.8%
Navarre	1.5%	1.4%	1.4%	1.3%	1.4%
Basque Country	5.9%	6.0%	5.0%	5.2%	5.2%
La Rioja	0.6%	0.6%	0.7%	0.7%	0.7%
Ceuta and Melilla	0.3%	0.4%	0.3%	0.3%	0.3%
Urban / Rural					
Urban	78.9%	80.4%	75.9%	76.2%	76.2%
Rural	21.1%	19.6%	24.1%	23.8%	23.8%
Density					
Densely populated areas	54.3%	56.4%	50.2%	49.4%	49.8%
Medium population density	18.6%	18.3%	18.8%	19.7%	19.3%
Sparsely populated areas	27.2%	25.3%	31.0%	31.0%	30.9%
Household members					
One	4.9%	5.2%	11.2%	3.6%	5.6%
Two	17.2%	17.2%	24.2%	15.3%	18.2%
Three	23.7%	23.6%	23.0%	21.9%	22.3%
Four	32.4%	32.5%	26.6%	33.7%	31.2%
More than four	21.7%	21.5%	15.0%	25.5%	22.7%
Social class					
Upper	16.8%	17.9%	10.1%	10.7%	10.4%
Upper-Middle	11.8%	12.4%	9.1%	10.1%	9.7%
Lower-Middle	57.2%	56.4%	58.9%	60.5%	60.0%
Lower	14.1%	13.3%	21.8%	18.8%	19.9%
Monthly household income					
Up to EUR 390.6	2.6%	2.5%	7.3%	3.7%	4.7%
EUR 390.7 to 781.3	15.2%	14.5%	24.9%	20.1%	21.4%
EUR 781.4 to 1.171.9	25.1%	24.7%	27.1%	28.4%	27.9%
EUR 1,172.0 to 1,562.6	22.4%	22.4%	19.6%	22.3%	21.6%
EUR 1,562.7 to 1,953.2	12.6%	12.6%	9.0%	10.5%	10.1%
EUR 1,953.3 to 2,343.9	7.8%	8.0%	5.0%	6.0%	5.8%
EUR 2,344.0 to 3,906.5	12.1%	12.9%	6.2%	7.8%	7.4%
Over 3,906.6	2.2%	2.3%	0.9%	1.3%	1.2%

Distribution of CO_2 emissions in final demand (households), and by number of households, per head and per unit of consumption (modified OECD scale). 1999

	Situation in 1999		Simulation equalising spending per household	
	Per capita	Per unit of consumption	Per capita	Per unit of consumption
TOTAL	***7.42***	***11.76***	***7.78***	***12.32***
Region				
Andalusia	6.17	10.03	7.06	11.48
Aragon	7.89	12.23	8.62	13.35
Asturias	7.40	11.42	7.82	12.06
Balearic Islands	8.18	12.52	9.39	14.37
Canary Islands	6.20	10.01	7.25	11.70
Cantabria	8.15	13.05	7.07	11.32
Castile-León	7.10	11.01	8.54	13.25
Castile-La Mancha	6.35	10.18	7.64	12.25
Catalonia	8.95	13.95	8.52	13.28
Valencia	7.18	11.31	7.75	12.20
Extremadura	4.87	7.74	7.52	11.95
Galicia	6.89	11.01	7.14	11.41
Madrid	8.66	13.69	8.21	12.99
Murcia	6.88	11.10	6.96	11.23
Navarre	8.14	12.59	8.18	12.66
Basque Country	8.47	13.38	7.17	11.33
La Rioja	7.31	11.48	7.97	12.52
Ceuta and Melilla	6.44	10.65	6.22	10.28
Urban / Rural				
Urban	7.68	12.17	7.77	12.32
Rural	6.59	10.44	7.79	12.34
Density				
Densely populated areas	8.16	12.81	8.02	12.60
Medium population density	7.02	11.31	7.29	11.75
Sparsely populated areas	6.50	10.33	7.70	12.22
Household members				
One	10.33	10.33	27.57	27.57
Two	8.32	11.12	12.35	16.51
Three	8.05	12.50	8.14	12.64
Four	7.14	12.20	5.98	10.23
More than four	6.31	11.27	4.33	7.73
Social class				
Upper	11.72	19.10	7.62	12.42
Upper-Middle	8.73	14.44	7.08	11.71
Lower-Middle	7.03	11.23	7.49	11.96
Lower	5.57	8.36	8.93	13.39
Monthly household income				
Up to EUR 390.6	5.27	6.58	16.77	20.92
EUR 390.7 to 781.3	5.64	8.39	9.77	14.53
EUR 781.4 to 1.171.9	6.58	10.62	7.29	11.77
EUR 1,172.0 to 1,562.6	7.46	12.20	6.75	11.03
EUR 1,562.7 to 1,953.2	8.93	14.67	6.60	10.84
EUR 1,953.3 to 2,343.9	9.63	15.95	6.28	10.40
EUR 2,344.0 to 3,906.5	11.57	19.37	6.14	10.29
Over 3,906.6	12.83	21.59	5.88	9.89