Evolution of Fuel Consumption and Emissions in Spain From the Analysis of Statistical Series

Ecological Economics

Keywords: oil, sustainability, transport.

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Abstract

In Spain there is a strong dependence of the consumption of fossil fuels, especially oil, coal and natural gas. In the case of oil and its derivatives, the bulk of consumption is located in the sectors of industry and transport, with special emphasis on transport of goods by road, in a context of lack of policy measures designed to foster other energy uses, production or transport models.

The situation is worrying, especially in the current scenario in which the own International Energy Agency has recognized the existence of "peak oil", with all that that implies for its implications on the society of the future, the whole economy and, in particular, energy development and its limitations.

In this paper, perform a descriptive analysis of consumption and fuel prices in the period 1993-2011, with a further approach to the study of evolution. The ultimate goal is to reflect, from the perspective of ecological economics, possible guidelines to be implemented to improve the situation and assess their impact. There will be a descriptive statistical analysis to assess the significance of the data, analyzing the evolution and relationships, and a critical analysis of its environmental and economic impact.

1. Introduction

Life on the planet Earth has its source of power in the sun and all the power we want to apply results from a transformation of solar energy (Passet, 1996, p.189).The energy can manifest itself in many forms, and can differentiate between those that correspond to a particular state of organization of matter: mechanical energy, thermal, electrical, chemical, nuclear, and radiation. Any use of one of these forms leads to a collapse, a loss of power quality, to be subjected to the law of entropy (second principle of thermodynamics). So that the production of heat in the process of transforming a mode of energy to another, due to the law of conservation of energy (first principle of thermodynamics), may partially transformed into work, in addition to being able to also involve a loss of mechanical energy. This feature is own of the economic activity, because any good material can result in the amount of energy that retains; all work force is a potential energy capable of releasing energy, and any productive capital created by mankind is the result of a work that can be expressed in energy units (Ibid,p. 190-216).

The industrial development, from the creation of the steam engine, forms the basis for the expansion of the advanced industrial societies, scoring the fight against the middle, especially since the heat was able to transform in movement and created systems of transportation gives energy. Little by little the human force and animal labor was replaced by energy conversion techniques, which reduce costs for the owners. In parallel emerged migratory processes toward the

centers of wealth generators and intensive in the use of energy, depopulated agricultural areas, and more popular the industrial cities. In short, it gave an increase in productivity that has its home in energy productivity, at a time when a wide range of new products and a new structure of social classes. In this context, the steady increase of the consumption of energy appears to us as a sample of advancement, a development of the productivity, the internationalization of the economy and, above all, the empowerment of energy efficiency, but also as a manifestation of an energy model expired and damaging to the environment (Sheer, 1993, p. 31-33).
Spain has an energy model very vulnerable, due to their strong dependence on the consumption of fossil fuels, especially oil and its derivatives, whose consumption is mainly located in the industrial sector and in transport.

The descriptive statistical analysis and evolutionary in consumption and prices of fuel in the period 1993-2011 starts with a characterization of the main features of the current energy sector, and in the case of Spain in particular. The following are the results of the statistical analysis carried out considering the significant data consumption and prices, to be able to determine its evolution through the application of contrasts of structural change complementary.

2. General Features of the Energy Sector in the Contemporary Economy

The consumption of energy, regardless of the type of employee resource, is present in any activity of today's society, and, given the level reached, same seems abusive, so that the practices of savings (Miguélez, 2003, p. 16). They are being presented as urgent need energy. Behind this state of affairs lies the way in which it was understood the economic development, as indicated earlier, that in the form of lighting, domestic uses, and transport systems, allowed us to walk to a use of the energy each time less rational and most inefficient (Menéndez,1997, p.33-36). Modern societies, immersed in a constant growth, a growing weight of the urban population, and a continued pursuit of the increase in productivities economic and production, have led to an exponential increase in energy consumption, without sacrificing the ability of self-sufficiency will increase in the same way (sometimes gives the opposite process), and causing a high degree of environmental contamination with harmful consequences for their climatic effects.

This evolution was the only in a century, so that in 1850 the fuels more employees were wood and charcoal, with a total annual consumption per capita of 500 kg of Wood. In 1990, the annual aggregate consumption per capita of fossil fuels and primary electricity was equivalent to 1.5 tons of oil. There was an increase in the amount of energy consumed and change the type of fuel used. The energy crisis of 1973 highlighted the need to develop the use of renewable energies that barely occupied a place in the world supply, to make it competitive with conventional sources and, in this way, set up as a complement to the same. But what is really important, was to reach out to get its competitiveness in terms of environmental balance, social welfare and rationality in the use (Regueiro-Ferreira, 2011a). There are differences in the energy structure of countries in terms of its role in the international division of labor, the model of development continued, the available energy resources and, ultimately, the characteristics of its productive structure, resulting in addition to diverse energy uses. Countries with higher levels of income are at a greater

consumption of energy, because the people demand more goods and services, production and distribution of the same leads to a greater energy demand, while the mobility of people and goods is increasing. Heavy industry and the transport sector are consumers of energy intensive, while the services sector and agriculture are at much lower levels. Usually, a country that is subject to a process of economic growth with a dynamic he settles tends to increase the consumption of energy, as do a consumption patterns and social organization. All contribute to the mechanization of economic activities and growing domestic energy consumption due to the higher elevations in the per capita income, the consequent modification of the family demand, raising domestic demand. Even so, although the trend above is a widespread practice, it can also give place to a growth rate of energy consumption that to achieve certain levels of income will be less intensive, with a decline in the marginal propensity to consume, the tempo that technological improvements on the energy efficiency allow better unitary energy consumption for each produced item. However, the increase in aggregate demand makes that less intensity would be offset at many occasions with the increased demand for goods and services. The countries with the highest level of per capita income are experiencing greater consumption of energy in households, by what the per capita energy consumption is an indicator of the economic development of the countries. In parallel, not in the societies of the developed world, the use of energy has a much more rational: cooking, heating, lighting the homes, schools, hospitals (Menéndez, 1997, p. 27-30 and 36-38).

The current global energy system responds to the evolution of the capitalist system. This system is based on the use of non-renewable energy sources (first coal, then oil or uranium). In recent years, we have recourse to a new change, a new energy model, in which energy needs are rising up to the point of requiring the use of all kinds of sources of energy, both fossil and renewable energy.

In accordance with the classification of the natural resources of Jacobs (1996, p. 46-47) could distinguish three types of energy sources:

- Non-renewable resources: those that cannot be regenerated naturally in a range of human time, but that it would take billions of years. Are the fossil fuels (coal, oil, gas) or nature (uranium ore, etc)? From the economic perspective, the supply of these resources is presented as fixed, which decreases with the consumption.
- Renewable Resources: those that regenerate naturally, despite its continued use. Water, Wind, hydrogen or biomass[1]. It is advisable to qualify that human activity and the alteration of ecosystems can affect the availability of renewable resources, and may be exhausted.
- Ongoing Resources: are the energy sources that do not have an altered its offer by human activity. This is the case of the sun's energy, which produces solar radiation and wind energy, and gravity, which causes the energy of the tides and the energy of the waves and

[1]. From the wood, in order to obtain heat, energy crops (oleaginous, arable, woody or algae) to obtain electricity or agro fuels, agricultural waste, forest, or animal that extract biogas, heat, or fuels.

the hydroelectricity (partially renewable), as well as the geothermal energy that is generated by the heat of the earth's crust.

In the more conventional designation, renewable energy would correspond with that in the previous classification would be both renewable and continuous. Given the widespread use of the category of renewable energy for all of them, take that same denomination. So that, if reference is made to the classification is useful because it is considered the difference between those that are renewable in *stricto sensu* and those that have a continuing character. This difference leads us to a question as important as the renewability and is often overlooked, is the nature of strenuous or not of the energy source.

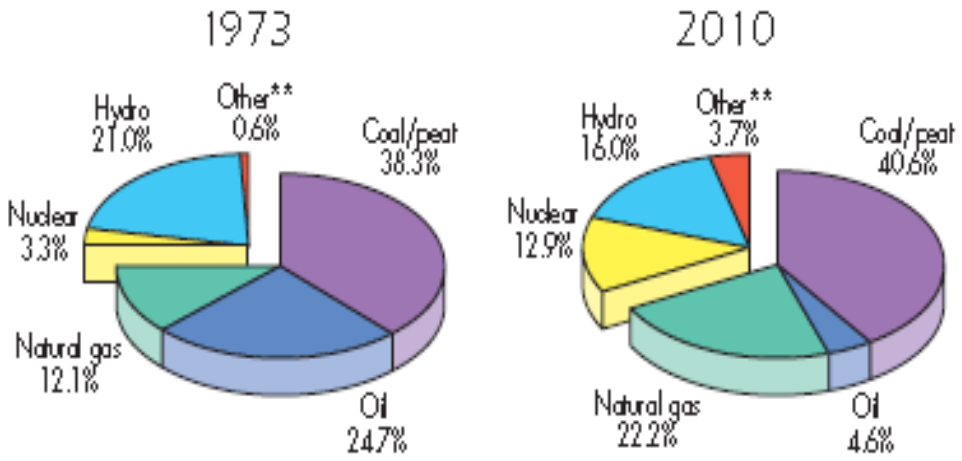
If the reasons are obvious the exhaustible nature of non-renewable energy sources, they are not so much that can be given in renewables. While in the renewable energies in stricto sensu the strenuous is determined by the respect or not to the cycles of the ecosystems that guarantee renewability (in a living being that does not guarantee by playing the refitting of the individuals that disappear, we will make it disappear), In the continuing sources the inexhaustibility is assured because it does not depend directly on human action[2], Although this inexhaustibility does not entail the absence of constraints (space, economic, technological or institutional). Therefore, although using the generic name of renewable energies, we will consider that dual status of sources with exhaustible nature or not, particularly important in certain energies, as is the case of wind energy (Regueiro-Ferreira, 2011b).

3. The Main Data of The Current Energy Model. The Particular Case of Spain

The global energy system responds to the current ongoing and continuous evolution of the capitalist system, which has been based on the use of non-renewable energy sources (coal, oil or uranium), although has submitted changes in the last few years, evolving into a new energy model in which the needs of energy are growing to the point of requiring the use of sources both fossil and renewable energy (figure 1).

[2] Although the impact of activities on the global climate has just by having effects on the regimes of winds or the water cycle.

Figure 1. Levels of Fuel for the Generation of Electricity (1973- 2010)



Notes: **: wind, solar, geothermal, biofuel and biomass

Resource: IEA (2011)

The consumption of world primary energy in 2010 recorded an increase of 5.6 % over the previous year, being the most significant increase from the year 1973 (BP, 2011) and presenting different shades for regions and energy sources. Taking as reference the data offered by the publication annual Statistical Review of World Energy of British Petroleum (BP), the characterization of the current world energy outlook is as follows:

- In the case of oil, in the OECD countries, the increase was 3.5 %, its most significant value since 1984, despite the fact that still stood at around the values of a decade ago and taking into account the current situation of economic crisis. For the non-OECD countries, the primary energy consumption will also increase, by 7.5 %, highlighting China that is currently the leading consumer of energy. The oil remains the leader representing 33.6 per cent of the total consumption of energy, although in the trend of continuing loss of market for eleven years. The average price per barrel Brent rose 29% in relation to the value of the 2009, due to the strong increase in consumption and the rate of production of OPEC countries, with a value of 2.5 %, and being from the 1.8 % in the non-OPEC producing countries. In relation to world oil reserves, the data illustrate a stalemate and that various sources[3] point out as evidence reached a peak in the capacity of removal and the start of a scenario of roof of the oil (peak-oil), which could place a de-provisioning continued demand.
- Natural gas also submitted a notable increase in its consumption, the 7.4 %, still the fastest recorded since 1984. This advance on values in the average consumption was widespread at the global level, with the exception of the countries in the region middle east of Asia,

[3] There are countless references in the past few years dealing with the topic of the roof of the oil, which we will highlight by way of small selection: Heinberg (2010), Rubin (2009), Bermejo (2008), Strahan (2008), Deffeyes (2009), Sempere and Tello (2007), Heinberg (2006), Deffeyes (2006), Campbell (2004), Roberts (2004),Rossi (2010)...

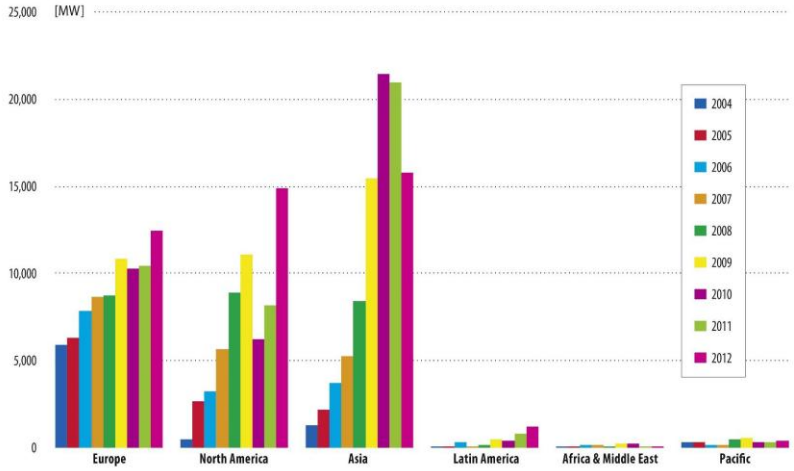
which reached values much higher. India (with an increase of 21.5 %), and Russia and China with values next to the 10% registered the most significant values in its history. The global production of natural gas also grew, in a value of 7.3 %, highlighting Russia (more than 11.6 %), United States (more than 4.7 %) and Qatar (more than 30.7 %). United States remains the world's leading producer, growing the provision of non-conventional gas despite the instability of prices of natural gas in this country.

- Coal consumption also grew in 2010 with a value of 7.6 % and remains the most rapid increase since 2003. Coal consumption represents 29.6 % of the total consumption of energy, being 25.6 % in 2000. In this context, China stands out whose coal consumption grew by 10.1 % and that consumed 48.2 % of the world coal. But also in other regions, the progress of its consumption was very significant, as in the case of the OECD countries, with a 5.2 %, and still the most significant increase since 1979.The production of coal also presented a positive movement, with a ratio of the world 6.3 %, representing China two-thirds of this growth.

- Hydroelectric production and nuclear continue to show a steady growth, which started in 2004. Hydroelectric generation experiment in the year 2010 and increase of 5.3 % at the global level, leading China such progress with the 60% of the total due to the intrinsic characteristics of its humid climate and the increase of his power. At the global level, the production of nuclear energy grew by 2 %, especially in the OECD countries, and in a scenario of "greater distrust" since the disaster of the Nuclear Power Plant of Fukushima (Japan).

- The generation of a renewable energy continues to be immersed in a rapid growth, highlighting the production of biofuels (with an increase of 13.8 %, located especially in the United States and Brazil) and the wind energy (at the global level with an increase of 22.7 %, located in China and the United States, primarily). Within the whole of the renewable energies, stresses the advancement of wind energy at the global level (figure 2).

Figure 2. Installed Wind Power by Regions (2004-2012)



Source: GWEC (2013)

These data correspond to the situation described by the International Energy Agency (IEA), alerting you to a different future that waits for the current energy system, a future that seems quite uncertain.

To describe the European and Spanish energy outlook, we will start with the primary energy or set of products capable of generating energy for final consumption. These products obtained both on the outside of the European Union as in the territory of the community will be transformed into available energy. Between 1990 and 2005 highlighted the growth of the renewable energies with a 3.47 % annual (table 1). For the period 2005-2030 it is estimated that to continue to grow at a rate of 2.67 % per annum. This development has been driven largely by the development of wind energy with an annual increase of 6.5 % (the biomass and the hydraulic increase at a slower pace, 2.67 per cent and 0.5 per cent per annum, respectively).

Table 1. UE-27. Own Primary Energy (1990-2030) (ktep).

	1990	**2005**	**2020(**)**	**2030(**)**
Solid fuel	365.918	196.451	141.764	125.808
Crude oil	128.809	132.993	53.111	40.820
Natural gas	162.447	188.021	114.934	84.761
Nuclear	202.589	257.360	221.472	206.403
Water	25.101	26.394	28.930	30.182
Biomass and waste	44.737	82.903	129.299	158.041
Wind	67	6.060	23.321	29.437
Solar and others	153	816	6.242	8.671
Geothermal	3.190	5.395	5.756	6.567
Total primary renewable energy *(1)	73.248	121.568	193.477	232.899
Total primary no renewable energy	859.763	774.825	531.281	457.792
TOTAL PRIMARY ENERGY (2)	933.011	896.393	724.758	690.691
% (1)/(2)	7,85	13,56	26,70	33,72

Notes: * Renewable energies are considered water, biomass and waste, wind, solar and other, and geothermal..
** Forecasts.
Resource: Doldán (2008) from European Comision (2008).

In the context of a strong energy dependence of fossil resources, Spain has a very similar energy model, which demonstrates its vulnerability to supply.

The different energy plans and the plans of renewable energy developed in the last few years have not succeeded in changing the energy model for the sake of a more sustainable economy and guarantee of supply, reducing our dependence on fossil fuels. The current situation of economic crisis has halted temporarily the growth in consumption in certain types of fossil resources, but the high dependence of the consumption of the same. On the part of the industrial sector and the transport, shows a clear fragility that endangers the future supply.

In the period 2000-2010, the evolution of primary energy in Spain has been marked by the growth, while in 2008 there was a decline in their levels with a slight recovery in 2010 (table 2). Spain is an importer of primary energy of fossil type, primarily from petroleum, natural gas and uranium needed for nuclear production. Oil consumption in Spain has submitted a continued growth, interrupted in the year 2008, due to the involvement of the current economic crisis.

Similar situation is seen in the evolution of consumption of natural gas in the same period, although the decrease in consumption recorded since 2008 has been much less significant than in the case of petroleum. The dependence of Spain of the coal has been marked by a succession of different regulations have visibly altered the level of external dependency.

Since 2008, there has been a decline in the consumption of the same; due to the energy plan in place and also to the exhaustion and indigenous mine closure. Hydropower production has not followed a regular evolution, due to the rainfall recorded in each year. However, the renewable energy has been a regular evolution and tremendously positive, placing Spain the first in the ranking world production from renewable sources, as is the case of wind energy.

Table 2. Evolution of Consumption of Energy, by Types, in Spain (2000-2010)

Types of energy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Variation 2010/2009
Oil (1)	1425	1469	1473	1533	1600	1623	1608	1629	1587	1525	1505	-1,6%
Natural gas (2)	16,9	18,2	20,8	23,6	27,4	32,4	33,7	35,1	38,6	34,6	34,4	-0,3%
Coal (3)	21,6	19,5	21,9	20,5	21,0	21,2	18,5	20,2	15,6	10,5	8,3	-21,3%
Nuclear(3)	14,1	14,4	14,3	14,0	14,4	13,0	13,6	12,5	13,3	11,9	13,9	16,8%
Renewable(3)	1,5	2,0	2,9	3,6	4,4	5,6	6,2	7,4	9,1	10,9	12,4	13,6%
Hidraulic (3)	7,7	9,3	5,2	9,3	7,2	4,0	5,8	6,2	5,3	6,0	9,6	6,09%
Primary energy(3)	130,2	134	135,9	144,4	151,1	153,4	154,1	158,6	157,1	146,1	149,7	2,5%

Resource: own elaboration from BP (2011)
(1): thousands of barrels per day
(2): trillion cubic meters
(3): millions of tonnes of oil equivalent

4. Statistical Analysis

In the current paper we carry out a study, from the descriptive point of view, on the behavior along time of the Spanish fuel consumption. Data correspond to three main products' consumption (in thousand tons.): petrol, diesel oil and kerosene. The period under study is 1993-2011, by means of monthly series obtained from the Ministry of Public Works' transport economic indicators. In order to do the exam, the habitual logarithmic transformation has been applied to the series, so as to correct their potential non-stationary in variance.
Table 3 reflects the main synthesis measures for our three consumption series. That table and the evolution of the series shown in graph 1 allow us to make a first reasonable approach to the features and behavior of Spanish fuel consumption.

Table 3. Summary of Measures

Measure \ Variable	**Petrol consumption**	**Diesel oil consumption**	**Kerosene consumption**
Mean	633.24107	1734.49554	363.20982
Median	637.5	1774	368.5
Mode	724	1952	355
Standard deviation	101.03356	305.63622	9158267
Variance	10207.78	93413.49774	838738627
Kurtosis coefficient	-0.50300	-0.53177	-0.65599
Skewness coefficient	-0.14665	-0.19044	0.11813

Source: own elaboration from the Ministry of Public Works (2011)

Fuel consumption, as most series in the economic-business framework, shows a non-stationary behavior in mean, as it deduced from the ADF (*Augmented Dickey-Fuller*) tests we have carried out. The results (reflected in table 4) clearly indicate that the null hypothesis of presence of a unit root is not rejected, in the three consumption series. In this case, it is said that there is not reversion to the mean in the data under study, and a steady trend along time is observed.

Table 4. ADF Unit Root Tests

Variable	t_α^*	t_α^{**}
Petrol consumption	-2.25493	1.61059
Diesel oil consumption	-1.79131	-2.01790
Kerosene consumption	-1.73496	-2.12706

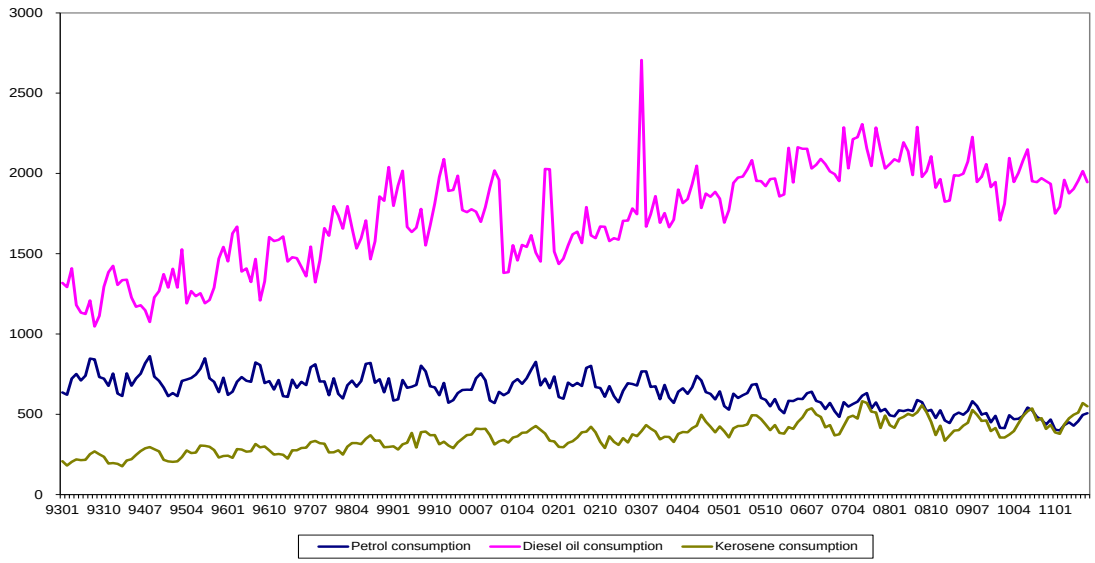
Source: own elaboration from the Ministry of Public Works (2011)
Notes. (*) The model includes as deterministic components a constant and a trend.
T_α critical value for a 0.05 significance level and n=100: -3.45.

(**) The model includes as a deterministic component a constant.
T_α critical value for a 0.05 significance level and n=100: -2.89.

With respect to the behavior of the series, four aspects are highlighted. First, graph 1 displays a growing trend for diesel oil and kerosene from 1993 up to the present, whereas petrol consumption decreases along the period. Likewise, petrol and diesel oil consumption series approximates each other as time passes by, taking on very similar values from 2007.

In the most recent years of the period under study, we appreciate stagnation in petrol and diesel oil consumption, but not in kerosene consumption. In this sense, the impact of the economic and financial crisis has been relevant and affected the evolution of those variables.

Figure 1. Fuel Consumption Evolution in Spain



Source: own elaboration from the Ministry of Public Works (2011)

An *a priori* determinant factor in the evolution of fuel consumption is its price, which is summarized in table 5 (in annual terms). The increasing evolution of prices, as much in petrol as in diesel oil, has caused a decrease in the consumption of the first type of fuel but not in the second one. The different effect could be associated with the fact that a relevant part of the consumption is employed in transport and industry, which mainly use diesel oil and must do it despite the price rising. Nevertheless, a slowing down in consumption growth is appreciated from 2005 on; prices experienced a remarkable increase that year.

Table 5. Average Fuel Prices By Typology

Years \ Prices (€/l)	**IO.95 Petrol**	**A Diesel oil**
1998	0.67	0.53
1999	0.70	0.57
2000	0.82	0.70
2001	0.81	0.70
2002	0.81	0.69
2003	0.82	0.70
2004	0.87	0.76
2005	0.96	0.90
2006	1.03	0.96
2007	1.05	0.97
2008	1.12	1.14
2009	1.00	0.91
2010	1.16	1.08

Source: Directorate-General of Energy and Mining Policy (Ministry of Industry, Energy and Tourism)

Note. Weekly prices' average.

In addition and, to a great extent, linked to the evolution of the trend there might exist a structural break in the behavior of our series. This question especially arises due to two reasons: the first is a general one, concerning the effects of the economic crisis on fuel consumption; the second is particular one, as it is focused on the evolution of diesel oil consumption, where *a priori* a change in its trend could be set out (see graph 1).

For this purpose, three complementary structural break tests are carried out: the Andrews-Ploberger test, the Andrews-Quandt test and the Bai-Perron test. The two first procedures are used to test a unique break in an unknown point within the sample; the latter accounts for a multiple

structural break analysis (in this paper, we assume a maximum of two break points). It must be pointed out that all the tests are developed using the variables in differences, so that the break dates will refer to growths instead of levels (of the series).

Table 6 reports the results we have obtained. Unlike the expect *a priori* result, there is no clear evidence of structural break in diesel oil and kerosene consumption series; the structural break would take place in petrol consumption. Following the Andrews-Ploberger and the Andrews-Quandt tests, the null hypothesis of no structural break is not rejected for diesel oil consumption; on the other hand, the Bai-Perron test detects two break points in the series: August 1994 and December 1999. The last date would concur reasonably well with the graphic analysis.

Table 6. Structural Break Tests

Variable \ *Test*	Andrews-Quandt Test		Andrews-Ploberger Test		Bai-Perron Test	
	p-value	Break point date	p-value	Break point date	Break point dates	
Petrol consumption	0.0818	2001:09	0.0541	2001:09	1993:12	2001:09
Diesel oil consumption	0.7875	-	0.6257	-	1994:08	1999:12
Kerosene consumption	0.5866	-	0.3535	-	1994:02	1999:12

Source: own elaboration from the Ministry of Public Works (2011)

A similar situation takes place with the kerosene consumption series. The Andrews-Ploberger and the Andrews-Quandt tests do not reject the null hypothesis, so we find evidence of structural break, but the Bai-Perron test points at February 1994 and December 1999 as break points. Regarding the empirical results, it must be noted that the Bai-Perron test tends to evidence structural breaks in all cases; this is one of the reasons why the analysis is completed with the other two tests.

5. Conclusions

The current global energy system has been a response to the evolution of the capitalist system, and has been characterized by the non-sustainable use of non-renewable energy sources. Its limits are already an uncomfortable reality, recognized by different international organizations related to the field of energy, alerting people to the uncertain future for the growing energy needs as well as the negative impact on the environment, and recognizing the importance of using other alternative sources such as renewable energy

In summary, the energy model is not contemporary argues, has a useful life expires, compared to a solution that is prolonged in time and significant economically: change to an alternative system, in which take part other sources of energy, social, economic and environmentally sustainable, along with drastic adjustment demand policies.

In this context, it is confirmed that Spain develops an energy model very vulnerable, with a strong dependence of the consumption of fossil fuels, whose prices are immersed in an upward path, and whose environmental impact is out of any discussion.

The descriptive and the time series analysis of fuel consumption and prices in 1984-2010 have strengthened the characterization of the evolutionary trend of this fossil fuel; nevertheless, data

constraints, as well as the impossibility of having complementary data – requested to the corresponding Ministry – must be taken into account.

In two of the series under analysis, we do not find clear evidence pointing towards the existence of a break in the trend. In the opposite, the petrol consumption series evidences a structural break. Andrews-Ploberger, Andrews-Quandt and Bai-Perron test points to September 2001 as the break point date; the causes may be the consumption dynamics existing that date and the effect of the economic and the international situation.

Another aspect to highlight is the marked seasonal pattern all the series under study display; in this sense, consumption decreases in January and February for diesel oil and kerosene, and in January for petrol. The explanation may be found in the own dynamics of the economy and the features intrinsic to the first months of every year.

Finally, there is an outlier in the diesel oil consumption series in July 2003. The noticeable growth in this date can be related to three factors: the problems derived from Iraq war, which affected the fuel; the registered temperatures; and a considerable volume of traffic displacements.

Furthermore, in a situation of economic, financial and energetic weakness as it is the current one, the environmental evolvement is confirmed; it is necessary to emphasize the importance of supporting a more sustainable energetic model, where renewable energies are a key element (bear in mind that Spain ranks in the first position in relation to the production of electrical energy of renewable type, like the wind one). Regarding this fact, the knowledge of the real demand for energy in Spain, as well as the real and the potential offer, is revealed as an essential starting point; it allows for defining concrete actions aimed at changing the demand for energy and reducing the environmental damage.

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