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Environmental Performance and Firm Value: Evidence from Dow Jones Sustainability Index Europe

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ABSTRACT: In this study we analyze the effects of environmental performance on the generation of firm value from Dow Jones Sustainability Index Europe. We use a sample of 122 firms from different sectors, except financial one, which belong to this Index for the years 2007 through 2009. The expected results, taking into account our hypotheses, should show a positive relationship between the generation of value and the environmental performance. Therefore, one of our main findings would be the importance of these behaviors in order to improve the economic performance, due to the better utilization of resources. These relationships are not demonstrated by recognition by the stock market, short-term.

Key words: Economic Performance, Financial Performance, Environmental Performance, Stakeholders Theory

INTRODUCTION

In the last decade, catastrophes of nature, the steady degradation of our natural heritage by global warming or the destruction of the ozone layer by greenhouse gas emissions have led the leading companies of different sectors to begin to be concerned and to act to make their businesses environment-friendly (COM, 2001; Petraru and Gavrilescu, 2010; *;* Segarra-Ona *et al.*, 2011; Martinez-Paz and Perni, 2011; Bruni *et al.*, 2011; Perez-Caldern *et al.*, 2011; Pirani and Secondi, 2011; *Mondejar-Jiménez et al., 2011;* Garcia-Pozo *et al.*, 2011; *Spanou et al., 2011;* Junquera, 2012). So, today's organizations have changed their traditional philosophy of profit or shareholder value maximization for another way of thinking, in which the importance of these aims is relative, and active commitment to the different aspects of corporate social responsibility (CSR): social, environmental, and even ethical behaviors, becomes a priority (Moneva and Ortas, 2009; Van Tulder *et al.*, 2009; Mossalanejad, 2011; Arsalan *et al.*, 2012; Moghimi and Alambeigi, 2012). According to Stakeholders Theory, the purpose of this behaviour is undoubtedly to align the interests of the organization's different stakeholders with those of the company itself (Freeman, 1984; Adams and Frost, 2008). Companies expect the satisfaction of these interested parties to have a positive effect, increasing value creation from three perspectives: internally, by improvement of profits due to the competitive advantages obtained, increased turnover, lower production costs or the avoidance of any unexpected costs due to labour, social or environmental contingencies (Porter and Kramer, 2002); external, the increased demand for company shares raising their price on the markets (Orlitzky *et al.*, 2003; Allouche and Laroche, 2005); and jointly, by the synergies created between the previous two perspectives which favour each other, in that the increase in company size will encourage the generation of profits which will encourage future shareholders to accept a higher share price. Also, the increased profits from CSR will generate extra resources which can partly be rededicated to socially responsible management (Salzmann *et al.*, 2005).

There are two schools of thought in earlier literature about the relationship between environmental, economic and financial performance. On the one hand, some academics argue that a negative effect on economic and financial performance is to be expected if a company decides to adopt an environmental protection policy. This is because the investment required to reduce emissions or improve use made of natural resources is an excessive cost which reduces yearly results (Sueyoshi and Goto, 2009; Rassier and Earnhart, 2010). On the other hand, the opposite stance argues that companies with good environmental performance achieve competitive

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advantages which improve workers' productivity and consumption of resources and avoid costs related with lawsuits, or increase sales and share value because of the extra motivation this kind of behaviour means for the company's shareholders and customers (Hart and Ahuja, 1996; King and Lenox, 2000; Melnyk *et al.*, 2003). The theory called Porter's Hypothesis (Porter, 1991; Porter and van der Linde, 1995) has been used as a reference by many authors to argue the positive effects good environmental management can have on companies' economic results, economic performance (EcP). These authors maintain that pollution by companies is a source of inefficiency. Their working hypothesis takes the idea that pollution caused by companies is a sign of technological backwardness, poor management and inadequate use of production resources. So companies which manage to reduce their pollution will also reduce their environmental and production costs, so increasing their differentiation from their competitors or attracting new, environmentally aware customers. It is what is called a win-win strategy (Hart, 1995; Sharna and Vrendenburg, 1998; Majumdar and Marcus, 2001). According to the above, more demanding environmental management regulations would lead to greater competitiveness, innovation, efficiency or economic profitability for companies (Aragon-Correa and Sharma, 2003; Ekins, 2005). With regard to study of the effect of good environmental performance (EnP) and financial performance (FP), this subject of study has been chosen by quite a few researchers and has expanded greatly in recent years. Although there are some studies which show an indefinite or negative relationship between EnP and FP (Konar and Cohen, 2001; Wagner *et al.*, 2001), there are also others which come to the opposite conclusion, that there is a positive correlation (King y Lenox, 2002; Al-Tuwaijri *et al.*, 2004; Nakao *et al.*, 2007). This explains why a large number of researchers are motivated to carry out studies to find the effects and relationships established, one way or another.

So according to the review of the previous literature, the debate is open and with our study we wish to provide evidence about the relationships between environmental and financial and economic performance for companies listed on the Dow Jones Sustainability Europe Index (DJSEI). We take the information published in sustainability reports as a reflection of the environmental management policies followed by the large European companies in the last decade and examine the effects they have on the financial and economic results of the large publicly traded European companies. We expect these companies to be concentrating their management on certain indicators (KEPIs, Key Environmental Performance Indicators) which allow them to manage their consumption of resources and emissions to air better (Searcy *et al.*, 2008; Linnenluecke and Griffiths, 2010; Petraru and Gavrilescu, 2010).

MATERIALS & METHODS

For our purposes, we are taking the following relationships as our initial hypotheses:

H_1: "Organizations with better environmental performance (EnP) are also the ones which achieve better financial and economic performance (EcP)"

Due to the increase in competitiveness brought by this kind of strategy, the effect of the savings achieved on the profit-and-loss account or the possibility of avoiding additional or unexpected costs due to poor EnP which can reduce net profit (EcP).

H_2: "Organizations with better environmental performance are also those which active greater generation of external value (FP)"

In principle, it is to be expected that we will find a positive relationship between better EnP and the companies better valued by the stock market (FP), with greater differences between their book value and that given to them by the stock market. In principle, the market and other stakeholders should value responsible environmental behaviour positively.

We use two types of statistical techniques, the Stochastic Frontier Analysis (SFA) and cluster analysis. Respect SFA, the first pieces of work are those from Aigner et al. (1977) and Meeusen and Van den Broeck (1977). We apply SFA in our study, with these pieces of work being based on a data panel where all of the variables are quantities. The production efficient frontier identifies the maximum quantity of product that a particular production unit can obtain or the profits that it has been possible to generate (output) on the basis of a set of emissions to air and consumed resources (inputs). In this first analysis we obtain the relative position of each one of the firms groups with respect to the efficient frontier according to their water-energy consumption and their emissions to air, for every year and for the whole of the study period (2007-2009). In order to classify the firms of our sample into homogenous groups according to their characteristics we use the groups or cluster analysis. In our case, to group the companies together we use the K-measurements non-hierarchical (quick cluster) method. This technique is a useful method for making a division of individuals into k-groups, where this k number must be set on an a priori basis (Ferrán-Arranz, 2001). To focus first on the relationship between EnP and EcP, in review of the literature we found that the most frequently used variables were return on assets –ROA- and return on sales –ROS- (Hart and Ahuja, 1996; King

and Lenox, 2002; Poutz and Russo, 2009). The indicators most used by academics to study the relationship between EnP and FP are Tobin's Q, the market-to-book ratio –MBR-, return on capital employed –ROCE- and return on own funds -ROE and ROI- (Elsayed and Paton, 2005; Rassier and Earnhart, 2010). In our study, as variables representing EnP, we shall use the efficiency achieved by each company in its respective sector in consumption of energy and water, and emissions-to-air of CO_2, NO_x and SO_2, in the period 2007 to 2009. In the same sense with Henri and Journeault (2010), we are aware that these variables only represent one of the dimensions of EnP among other perspectives (customer satisfaction, quality, productivity, or innovation). With regard to the variables representing financial and economic performance, we have chosen to use the same ones as most studies reviewed in the earlier literature, i.e., ROA, ROI and MBR. The classification established by the DJSEI has been used to group companies into sectors. A variable ES has been used to indicate the sector's environmental sensitivity, being given the value 1 when the company's sector is environmentally sensitive, i.e., the production activity it carries out implies high environmental impact, and 0 if not. This variable was also used in earlier studies (Aerts *et al.*, 2008; Cho and Patten, 2007). Our study population is made up of the companies included in the DJSEI Selection. In September, 2010, this index consisted of 157 companies with a total capital of 4,375 billion euros. Companies whose business is classified in the financial sector have been excluded, because the peculiarity of their accounting standards makes their financial and economic ratios vary considerably, so they are not comparable with other sectors. The financial details were taken from the AMADEUS database. The information on environmental performance was taken directly from the sustainability reports published by the companies on their corporate websites.

RESULTS & DISCUSSION

A short summary of the company sample used is included in the final appendix of tables (see Tables 1 and 2).

We began data analysis with correlations analysis to find possible relationships between variables and the formation of groups due to the affinity of companies' behaviour and features (see Table 3). It can be seen how those representing size (TA –Total Assets, EB –Ebidta- and S –Sales-) are highly correlated. The same thing happens with those representing consumptions o resources (EUe –energy- and EUw –water-), and emissions to air (ECO, ENO, ESO). Correlation between the variables for consumptions and emissions is also seen, especially with ECO and ENO. Similar behaviour is also discerned

Table 1. Statistics Sample

	N	Min	Max	Average	S. Dev.
TA	120	1011131,00	441110000,00	33345856,4764	51618218,45338
EB	120	21720,77	23722000,00	3641461,7614	5017634,75469
ROA	120	,0042	,3149	,122028	,0639298
ROI	119	,0408	78,1900	20,050994	13,9491996
ROS	120	,0074	,6211	,184041	,1156402
MBR	102	-13,98	6,18	1,7602	2,57217
EUe	77	,00008	44527,99068	1308,9375026	6609,15136711
EUw	56	,00622	215212,08769	3961,2300349	28748,49245195
CO_2	58	-19,774011	3180,506993	64,91337907	417,786455522
SO_x	42	-24,858757	25,756825	4,48895022	8,899337913
NO_x	43	-12,429379	1293,042772	41,97756130	197,170141565

Table 2. Frequency and relative importance of companies

Sectors	Frecuency	Percentaje	Accumulated
BBC	19	15,8	15,8
ENE	20	16,7	32,5
IND	28	23,3	55,8
MBS	14	11,7	67,5
SSC	29	24,2	91,7
TEC	10	8,3	100,0
Total	**120**	**100,0**	

Table 3. Bivariant partial correlations

	TA	EB	S	ROA	ROI	ROS	MBR	EUe	EUw	ECO	ENO	ESO
TA	1											
EB	**,57***	1										
S	**,60***	**,82***	1									
ROA	-,13	**,30***	,02	1								
ROI	,01	**,24***	,07	**,48***	1							
ROS	,14	**,37***	-,01	**,52***	**,31***	1						
MBR	,04	,05	,05	-,15	,11	,01	1					
EUe	**,44***	**,41***	**,36***	,17	,20	**,38***	,10	1				
EUw	**,47***	**,46***	**,41***	**,35***	,23	**,41***	-,08	**,65***	1			
ECO	**,52***	**,46***	**,51***	,02	,07	,17	,08	**,61***	**,47***	1		
ENO	,32	,33	**,36***	**,35***	,28	,07	,24	**,62***	**,72***	**,624***	1	
ESO	,07	,107	,15	,12	,03	-,18	-,00	,19	,44	,39	**,749***	1

between the variables size, consumptions and emissions, but not between the economics profitability ratios (ROA, ROI, ROS) and market value (MBR) and consumptions, except in the case of ROS. Neither is a clear relationship observed in principle between market value and emissions.

From the cluster analysis applied to the whole sample of companies, beginning with the variable related with total emissions to air (ENCS) the groups formed are homogeneous with regard to sizes, return ratios and market value, all having an influence on the formation of groups and the maximum level of significance (see Table 4). Companies with greater profitability and market value are not, on average, the most efficient (cluster 2); the group of companies with the worst returns ratios and market values are also those with the lowest efficiency variables (cluster 1), on average. In addition, the companies with the largest average size are also the most efficient in terms of emissions to air (cluster 3).

In the study of energy consumptions (EUe), all variables are significant and therefore, all influence the formation of the final groups (see Table 5). A group of three companies is obtained which are the most efficient and those of greatest average size (cluster 4). Comparing the most numerous groups (clusters 1 and 2) the one with highest average returns is also the one which achieves the best efficiency level (Group 1). The other group includes the companies with lowest returns and efficiency, on average.

Table 4. Emission efficiency (ECNS). Centers of groups and ANOVA

	Clusters (number of firms)					
Variables	**1 (6)**	**2 (10)**	**3 (6)**	**4 (35)**	**5 (1)**	**ANOVA (p)**
ZTA	,19958	-,43985	1,70223	-,26967	-,53763	**,000**
ZEB	,07684	-,24787	3,01202	-,34012	-,45634	**,000**
ZROA	-,40026	1,69206	,52498	-,39325	1,87081	**,000**
ZROI	-,44807	,51331	,49052	-,44344	-,85003	**,000**
ZROS	1,56785	,61851	,54115	-,53088	,18996	**,000**
ZMBR	,03288	,19606	,08753	,06535	-9,59681	**,000**
ECNS	,576687	,625458	,815738	,666597	,485673	,384

Table 5. Energy Consumption Efficiency (EUe)

	Clusters (number of firms)				
	1 (14)	**2 (37)**	**3 (1)**	**4 (3)**	**ANOVA (p)**
ZTA	-,36997	-,25266	-,53763	1,54133	**,000**
ZEB	-,26423	-,34659	-,45634	2,94691	**,000**
ZROA	1,06130	-,46311	1,87081	,57037	**,000**
ZROI	,63925	-,45513	-,85003	,69943	**,000**
ZROS	1,23845	-,46469	,18996	,33714	**,000**
ZMBR	,11031	,05370	-9,59681	,08691	**,000**
EUe	,706892	,587767	,432379	,970414	**,040**

Finally, we get very similar results as for the above case in cluster analysis applied to the water consumptions variable (EUw), although the significance reached for this resource is not as high for 95%, but is for 90% of cases (see Table 6). A group of two companies is obtained with maximum efficiency compared with the others, being the largest companies in terms of size, and economic and financial profitability. Focusing on the two largest groups, it is observed that the companies with the highest average profitability (ROA, ROI and ROS) are also the most efficient.

It was not possible to carry out sector analysis because the number of companies publishing information for all the variables is very small, to the extent that for sectors the minimum number of observations for cluster analysis was lacking.
As an additional analysis confirming these results, we looked at the way environmentally-sensitive companies behave compared with those which are not (variable SMA). It is to be expected that, in both cases, those with the highest profitability and market value will also be the ones with greatest levels of efficiency in consumptions and emissions. For this purpose, two large groups of companies have been identified: environmentally sensitive or not, according to the impact of their activity on the environment.

The results are similar to those obtained in the analysis carried out of the whole sample, because most of the variables are significant in the ANOVA and the behaviour of companies is therefore very homogeneous. In the group of non-environmentally sensitive companies, for the emissions variable (ECNS), two groups are distinguished, those with greater economic returns, returns on sales and financial returns (ROA, ROS, ROI) and greater value on the stock market (market to book ratio, MBR) and another including the largest company. Although the difference obtained is not large, the most efficient companies in terms of emissions to air are those in the second group, those of greatest average size (see Table 7).

With regard to the energy consumptions (EUe) of the non-environmentally sensitive companies, those with greatest financial returns, returns on sales and stock-market recognition (ROI, ROS, MBR) are those which on average achieve the lowest efficiency. However, those with highest economic returns coincide with those which are most efficient in consumptions. In addition, a group (Group 1) is obtained which concentrates the companies with the worst profitability ratios and market value (ROA, ROI, ROS, MBR) and the least efficiency (see Table 8).

In water consumptions (Euw), the results are clearer (see Table 9), without taking the company consisting of one company into account because it is an atypical case, it is observed that Group 3 concentrates the companies which are most efficient in consumption of this resource and also achieve the highest profitability ratios (ROA, ROE, ROS, MBR).

In the case of environmentally sensitive companies, beginning with analysis of emissions efficiency (see Table 10), it is clearly seen that the group of companies with the highest profitability ratios (cluster 2) is also on average the most efficient in terms of emissions. Equally, the group with the lowest profitability ratios includes a large number of the least efficient companies (Group 3). With regard to energy consumptions (EUe), the most efficient companies are the ones with the highest economic profitability ratio (Group 2) and Group 4 includes the companies which are least efficient in terms of energy consumptions and coincide with those which are least profitable (ROA, ROI, ROS) and are worst seen by the stock market (MBR). Also, in water consumption, the most efficient companies are also those which have better recognition by the market and greatest economic profitability. Finally, the companies with the worst behaviour in use of this kind of resource are the smallest in size and have the worst stock market valuation, on average.

Table 6. Water Use Efficiency (EUw)

	Clusters (number of firms)				
	1 (7)	2 (1)	3 (2)	4 (25)	ANOVA
ZTA	-,29918	-,53763	1,13273	-,24477	**,001**
ZEB	-,18929	-,45634	3,09437	-,29704	**,000**
ZROA	,92518	1,87081	1,58895	-,36465	**,000**
ZROI	,54753	-,85003	,56393	-,30297	**,034**
ZROS	1,98096	,18996	1,07548	-,46951	**,000**
ZMBR	,20818	-9,59681	,05786	,01701	**,000**
EUw	,783679	,816338	,883323	,571313	,084

Table 7. Non-environmentally sensitive companies (ECNS)

	Clusters (number of firms)			
	1 (13)	2 (10)	3 (1)	ANOVA (p)
ZTA	-,07512	-,23471	-,53763	,715
ZEB	-,04573	,19372	-,45634	,806
ZROA	-,25196	1,70905	1,87081	**,000**
ZROI	-,56606	,51013	-,85003	**,003**
ZROS	-,25385	,81786	,18996	**,002**
ZMB	,06279	,32700	-9,59681	**,000**
ECNS	,682982	,665807	,485673	,751

Table 8. Non-environmentally sensitive companies (EUe)

	Clusters (number of firms)				
	1 (14)	2 (6)	3 (3)	4 (1)	ANOVA (p)
ZTA	-,23638	-,56316	-,02970	-,53763	,055
ZEB	-,31523	-,49975	,38121	-,45634	,052
ZROA	-,46181	1,99334	,74733	1,87081	**,000**
ZROI	-,56539	,30102	1,76027	-,85003	**,000**
ZROS	-,45548	,73456	1,07607	,18996	**,001**
ZMBR	,04853	,02991	,20734	-9,59681	**,000**
EUe	,587451	,684459	,585215	,432379	,714

Table 9. Non-environmentally sensitive companies (EUw)

	Clusters (number of firms)			
Variables	1 (1)	2 (9)	3 (4)	ANOVA
ZTA	-,53763	-,30650	-,44377	,476
ZEB	-,45634	-,37760	-,29660	,872
ZROA	1,87081	-,44772	1,67025	**,000**
ZROI	-,85003	-,34142	1,02737	**,029**
ZROS	,18996	-,34318	1,20641	**,005**
ZMBR	-9,59681	,06235	,29154	**,000**
EUw	,816338	,713419	,779511	,793

Table 10. Environmentally sensitive companies (ECNS)

	Clusters (number of firms)				
	1 (6)	2 (3)	3 (16)	4 (9)	ANOVA
ZTA	,19958	1,92361	-,42362	,07857	**,000**
ZEB	,07684	3,45333	-,57271	,12777	**,000**
ZROA	-,40026	,62121	-,71390	,22781	**,000**
ZROI	-,44807	,40955	-,58410	,32557	**,000**
ZROS	1,56785	,22100	-,70474	-,37938	**,000**
ZMBR	,03288	,05575	,03875	-,01118	,946
ECNS	,576687	,867289	,641737	,674825	,356

Table 11. Non-environmentally sensitive companies (EUe)

	Clusters (number of firms)				
Variable	1 (6)	2 (2)	3 (7)	4 (16)	ANOVA (p)
ZTA	,11685	1,72992	-,21719	-,36045	**,000**
ZEB	,02209	3,81834	-,20414	-,48465	**,000**
ZROA	-,33077	,99945	,33824	-,66777	**,000**
ZROI	-,31837	,42645	,58450	-,49985	**,000**
ZROS	2,06584	,43023	-,30408	-,70184	**,000**
ZMBR	,04982	,06527	,17512	,04098	**,001**
EUe	,924051	,955621	,591325	,554597	**,011**

Table 12. Environmentally sensitive companies (EUw)

	Clusters (number of firms)				
	1 (4)	2 (11)	3 (4)	4 (2)	ANOVA (p)
ZTA	-,02610	-,14510	-,49487	1,13273	**,015**
ZEB	,03277	-,20434	-,51238	3,09437	**,000**
ZROA	-,08876	-,63470	,51129	1,58895	**,000**
ZROI	-,32439	-,56317	,67854	,56393	**,001**
ZROS	2,52882	-,73688	-,40443	1,07548	**,000**
ZMBR	,06676	,05007	-,16562	,05786	,558
EUw	,777894	,485904	,443308	,883323	,060

CONCLUSION

To begin from the postulates of the Stakeholder Theory, the win-win strategy of Porter and van der Linde (1995) is only partly proven by our study. The business groups which showed greatest efficiency in energy and water consumptions in the study period 2007-2009 (EnP) are also the ones which achieved the best economic and financial profitability ratios (EcP). The evidence is even stronger when it is seen that in the groups listed as environmentally sensitive, efficient performance in consumptions of resources has a clear influence on economic and financial value generation, which is not the case for the group of non-environmentally sensitive companies. These relationships are not demonstrated by recognition by the stock market (FP). We cannot maintain the foregoing for emissions efficiency. So, the profitability of efficiency in energy and water consumptions has been shown, in spite of the extra costs and investment companies need to undertake. The stock market does not reward this kind of behaviour, in the short-term (Pogutz and Russo, 2009). One of the main limitations to the study is not having been able to carry out analysis by business sector, this being one of the criticisms most often found in review of the literature. The reason was the low number of companies which publish information about all the variables, which reduces the goodness-of-fit of the cluster analysis excessively.

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