EFFECT OF ENVIRONMENTAL VARIABLES ON FINANCIAL PERFORMANCE: THE CASE OF THE ELECTRICAL INDUSTRY

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Abstract

Nowadays, companies at the electrical industry have to meet numerous environmental requirements which involve a large increment in their costs. However, it is considered that these investments made by organizations may affect positively to their reputation and therefore to their profits.

So the aim of this paper is to analyze the influence that some Environmental variables related to the emission and resource reductions have on the Financial Performance of the electrical firms through a data panel methodology. The sample was composed by 72 electrical companies over the world, during the period 2008-2010.

Key Words: Data Panel, Electrical Industry, Emission Reduction, Financial Performance, Resource Reduction.

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1. Introduction

Companies are increasingly more concerned about being environment-friendly due to the pressures from several stakeholders and society (Molina-Azorín et al., 2009). They argue that firms have responsibilities and they had to reduce their impact on the environment (Hughes et al., 2001), so the environmental management should become in part of the core of the business.

Although there are lots of laws and regulations in most of the countries to prevent the environment, nowadays for firms it is not sufficient to comply with the law (Perez-Calderón et al., 2011). For this reason, organizations have been forced to change their environmental engagement and commitment exceeding the legal requirements and making significant investments to enable them to be eco-efficient.

Therefore, having an environmental responsible behaviour means to cope financially to high costs easy to identify and measure. However, the benefits of carrying out recycling or reducing the CO_2 emissions policies are not as straightforward to evaluate (Iatridis, 2013).

Despite the growing importance that being environment-friendly has in the business world, companies could not forget that their main purpose is their survival, so that a question arises: Is it worth being *green*?.

Even though the relationship between the Environmental actions and the Financial Performance (FP) has been studied in the literature (Hart and Ahuja, 1996; Clarkson et al., 2011; Dixon-Fowler et al., 2013), the results found are not conclusive.

Those who believe that behaving in an environment-friendly way impacts positively on the performance of the companies (Salama, 2005; Clemens et al., 2006), they argue that the positive influence comes from the saves in the costs and from a differenciation strategy. On the one hand, according to the Eco-Efficiency Theory (Porter and Van der Linde, 1995), it is possible at the same time to maximize the results of the companies and to reduce their impact on the environment and the use of the resources (Huppes and Ishikawa, 2005). On the other hand, as for differentiation, the win-win strategy (Hart, 1995) proposed that consumers are more and more sensitive and appreciate that a company cares the environment, and it increases its reputation and makes its products different from others.

However, Cormier and Magnan (2003) and Yu et al. (2009) argued that the implementation of environmental policies influences negatively on the firm´s performance which is supported by the Trade-Off Theory (Friedman, 1970).

The environmental variables used by each researcher have been different. While some articles value the environmental commitment through the voluntary disclosure in sustainability reports or surveys (Cormier and Magnan, 2003; Elsayed and Paton, 2005; Clemens et al., 2006), others value depending on the Emission Reduction (Hart and Gautam, 1996; King and Lenox,

2001), and others by the recycling and / or the use of smaller quantities of resources (Al-Tuwaiji et al., 2004; Perez-Calderón et al., 2011). Both variables Emission Reduction (ER) and Resource Reduction (RR) are going to be used to test if those practices impact positively or negatively on the FP.

We are focused in the electrical sector due to several reasons. Firstly, this industry was pioneer of carrying out CSR practices and publishing CSR reports because it is a sector with a high environmental impact (Hackston and Milne, 1996; Deegan and Gordon, 1996). Some of the main impacts in accordance to Larrinaga (1999) are environmental problems, social problems due to the building of installations and the distribution of the electricity, and finally the essential social function of electricity. Secondly, the activity of the electrical sector is one of the most socially and environmentally sensitive (Moneva et al., 2001).

2. Material and method

Based on the theoretical framework exposed previously, we are going to focus in our two independent variables (ER and RR).

Some authors have analyzed the effect that the ER has on the performance, obtaining diverse results. White et al. (1993), Hart and Ahuja (1996) and Smale et al. (2006) reported a positive influence, while Wagner (2005) and Gallego-Alvarez (2012) showed a negative impact. Consequently, our hypotheses are:

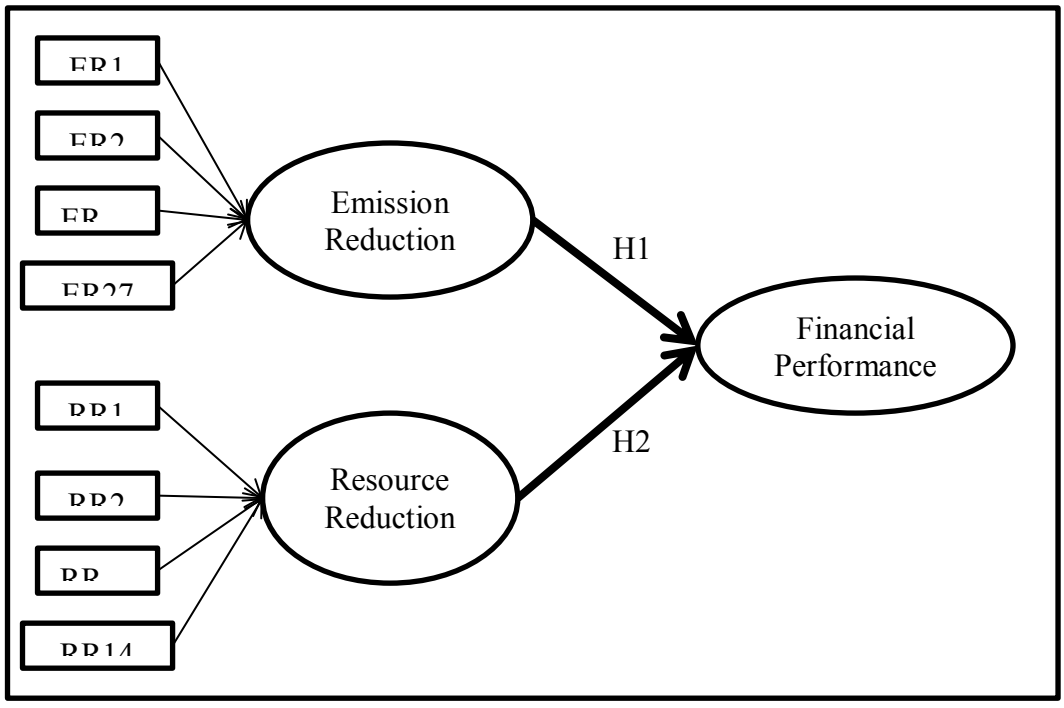
H1a: The more ER, the better the result obtained by the company.

H1b: The more ER, the lower the result obtained by the company.

Regarding to the influence of the RR on the FP, the evidence (Al-Tuwaiji et al., 2004; Pérez-Calderón et al., 2011) support the positive effect on the performance.

H2: The more RR, the better the FP.

Figure 1: Summary of the hypotheses.



Additionally, based on the fact that cultural characteristics from the countries affect to the Environment- FP relationship (Waldman et al., 2006; Pardo and García, 2011; Peiró-Signes et al., 2013), we added another hypothesis:

H3: The relationship between Environmental Responsibilities and FP will be different depending on the national cultural characteristics.

The sample is composed by companies from the electrical industry which operate worldwide and listed in the market stocks of each country. Finally, we found 72 firms which data about Social Responsibility were available at ASSET4 database for the period studied 2008-2010.

Moreover, the sample includes companies from 25 different countries which allow us to test additionally if the cultural caracteristics of the firms influence on the Environment- FP relationship. To measure the variables we will take the data from the Datastream database. As mentioned above, we will measure the Environmental Responsibility (Appendix 1) through the indicators available in DataStream grouped in: 1) ER and (2) RR.

We use traditional measures to measure the FP such as ROA, and other measure offered by DataStream: the Economic Score. Although the measures used for RF (accounting-based and market-based) seem to be accepted in the literature, there are still critics who argue that these measures do not adequately reflect the financial return that environmental actions have due to the own characteristics of these actions. This variable covers a larger definition of FP than those used in the literature, including several indicators grouped into three dimensions: performance, shareholder loyalty and client loyalty (Appendix 1). We also use each of these dimensions such as dependent variables in our study.

Finally, in order to be able to analyse the influence of the national characteristics, we use the GLOBE´s clusters (House et al., 2004; Appendix 2) to classify each company according to their origin country and the natural logarithm of total assets as a control variable.

To achieve our aims, we are going to use two different methodologies. Firstly, we are going to predict the score of the latent variables using PLS methodology (Partial Least Square). Once we have the scores of the latent variables, we estimate different panel data regression models through the program Stata 11.

2.1. Prediction of Latent Variables Scores by PLS.

The structural equation modelling (SEM) are a multivariate techniques that combine aspects of multiple regression and factor analysis to estimate a series of interrelated dependence relationships simultaneously.

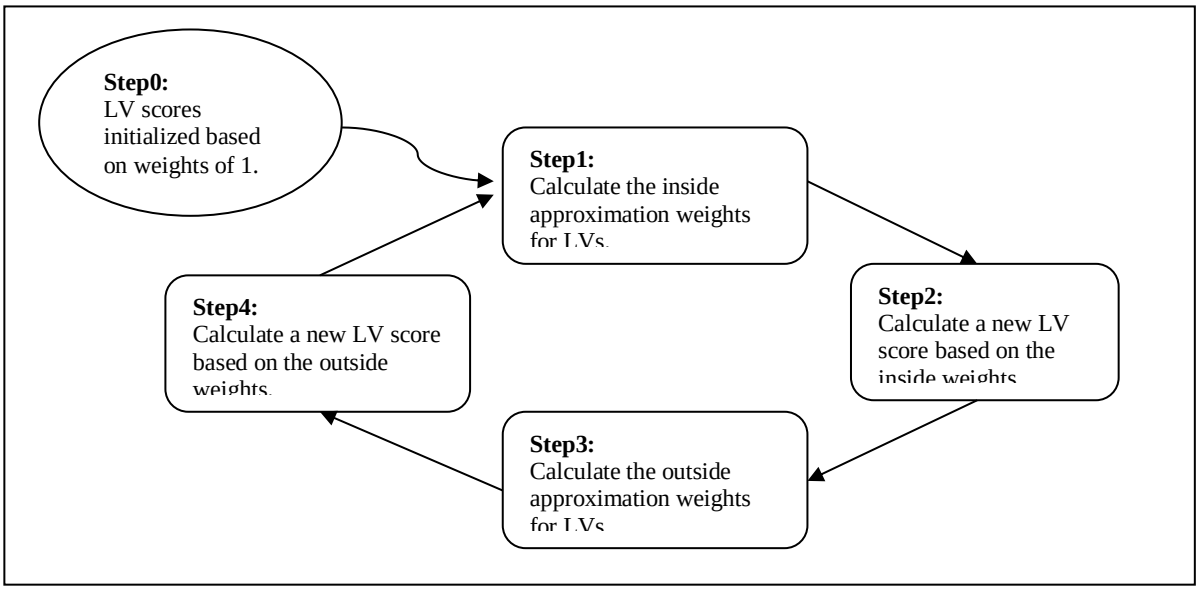
The data analysis through SEM has expanded rapidly in recent years in many fields of the social sciences but not in the accounting field (Lee et al., 2011) due to some reluctance by the researchers.

According to Roldan and Sánchez-Franco (2012) the SEM analysis can be carried out through two different statistical techniques: covariance-based methods (LISREL, AMOS) and variance-based methods (PLS).

The choice will be conditioned by the objective of each research. If the aim is confirming a theory, the covariance-based method are more suitable for the research, although the PLS could be also use. However, if the objective is related with predictions the PLS is more suitable (Chin, 2010). Additionally, PLS model calculates explicitly the scores of the latent variables, while the covariance-based method not. Since our aim using SEM is to get some predictions of the latent variable scores, we are going to use PLS.

Such as all the SEM techniques (Diamantopoulos, 1994; Gefen et al. 2000), PLS estimates: the measurement model (the relationship between the latent variables and their indicators) and the structural model (the relationship among the dependent and independent variables).

Figure 2: Prediction of the latent variable scores. PLS algorithm stage 1.



Source: Adapted from Lee et al. (2011)

According to Lee et al., (2011) in order to predict the value of the latent variables, PLS algorithm is based on two things: the indicators and the relationship of the latent variable with the other latent variable in the model. This process has three different stages, although we only are going to focus in the stage 1 (Figure 2).

From figure 2, we can deduce that in our study for each measure of financial performance (ROA, Economic Score, performance, and Shareholder Loyalty), the scores of the latent variables will be different, so it will be necessary to perform a different analysis with each one of them.

For testing the proposed hypotheses, we are going to use data panel methodology instead of continuing with PLS, because PLS technique considers each observation as an independent one and it is not possible to take into account that there are three observations from the same company, giving results with co-linearity problems.

2.2. Data Panel Regression

To test the hypotheses, we are going to estimate both fixed and random effects models. The fixed effects model involves estimating a parameter for each cross-sectional unit, while the random effects model assume that the variation across entities is random. In order to choose the best model, we have to test for the consistency of the random effects estimator in our analysis below by the Hausman test. A no significant value for the Hausman test statistic would imply that the fixed effects estimators are inconsistent and that random effects estimates are more appropriate to our analysis and this prove that there is not correlation between the fixed effects and one or more independent variables (Baltagi, 1995).

Therefore, we estimate four different models, because we test the same Environmental dimensions (Emission Reduction and Resource Reduction) with different measures of the performance (ROA, Economic Score, performance, Shareholders loyalty).

Finally, we repeat the random analysis introducing in the analysis three dummies based on the cultural cluster. Mainly, we focus on the Latin European, Anglosaxon and Confucian clusters because they have a significant number of firms in the sample.

3. Results and discussion

The results of the analysis are shown in Tables 1a, 1b and 2. In each one, we could see the coefficients of the regressions and their associated probability, as well as the corresponding test that shows the goodness of fit of the regression (F Fisher-Snedecor for fixed effects and test Wald for random effects). Additionally, Hausman test is presented in Tables 1a and 1b. This test helps to decide which one (between Fixed or Random) is the best of each variable.

Table 1 reveals that the best model is the fixed effects whatever the dependent variable is. If the FP is measured by ROA, the effect of both environmental variables (ER and RR) on the FP is not significant.

The influence of Emission Reduction is positive if we consider such as the FP measures the Economic Score and Performance, whilst the effect is negative if we consider the Shareholder Loyalty. These results agree with the evidence found by White et al. (1993), Hart and Ahuja (1996) and Smale et al. (2006).

Regarding the effect of Resource Reduction, we can say that positively affects the Economic Score and the Shareholder Loyalty, confirming the results obtained by Al-Tewaiji et al. (2004); Pérez-Calderon et al. (2011).

Table 1a: Panel data estimations of FP (I): ROA and Economic Score

Independent Variables	Dependent Variable			
	ROA		Economic Score	
	Fixed Effects	Random Effects	Fixed Effects	Random Effects
Constant	**54.473*** **	**74.336*** **	**29.873*** **	**20.329*** **
	(7.553)	(5.302)	(5.538)	(4.078)
Emission Reduction	**-0.174**	**-0.409*** **	**0.159** **	**0.304*** **
	(0.132)	(0.099)	(0.062)	(0.044)
Resources Reduction	**0.064**	**-0.076***	**0.222**	**0.203** **
	(0.047)	(0.031)	(0.093)*	(0.075)
Ln Total Assets	**-0.003*** **	**-0.001**	**0.001**	**-0.000** **
	(0.000)	(0.001)	(0.002)	(0.001)
F (3,141)	3.49*		**8.42*** **	
Test Wald		**27.02*** **		**142.72*** **
Hausman Test	**21.19*** **		**11.67** **	

***** < 0.005, **<0.01,*<0.05, †<0.1**

Table 1b: Panel data estimations of FP (I): Performance and Shareholder Loyalty

Independent Variables	Dependent Variable			
	Performance		Shareholder Loyalty	
	Random Effects	Fixed Effects	Random Effects	Fixed Effects
Constant	**21.559*** **	**55.800*** **	**21.559*** **	**55.800*** **
	(3.894)	(0.466)	(3.894)	(0.466)
Emission Reduction	**0.229*** **	**-0.043*** **	**0.229*** **	**-0.043*** **
	(0.032)	(0.007)	(0.032)	(0.007)
Resources Reduction	**0.226*** **	**0.016*** **	**0.226*** **	**0.016*** **
	(0.066)	(0.004)	(0.066)	(0.004)
Ln Total Assets	**-0.000**	**0.000**	**-0.000**	**0.000**
	(0.001)	(0.000)	(0.001)	(0.000)
F (3,141)		**23.12*** **		**23.12*** **

Test Wald	**160.43*** **		**160.43*** **	
Hausman Test	**12.71****		**35.55*****	

***** < 0.005, **<0.01,*<0.05, †<0.1**

In table 2 it is shown the influence of the cultural caracteristics on the estimation of the Financial Performance. Based on the results, we could say that the ER and RR measures of company from a Latin European or Anglosaxon country triggers a lower FP if we use ROA indicator, than in others countries. These results agree with those who argue that Environment is not in the core of the Latin European business, so they are not really engaged with it. However, if we measure the FP by the Economic Score are the Confucian countries those who show that making efforts in ER and RR produce a lower performance that in other countries.

Table 2: Panel data estimations of FP (II)

Independent Variables	**Dependent Variable**			
	ROA	**Economic Score**	**Performance**	**Shareholder Loyalty**
Constant	**76.587*** **	**27.009*** **	**22.845*** **	**55.382*** **
Emission Reduction	**-0.349*** **	**0.309*** **	**0.228*** **	**-0.024*** **
Resources Reduction	**-0.077***	**0.198****	**0.209*** **	**0.002**
Latineuropean	**-9.147****	**-6.382**	**3.793**	**-0.12**
Anlosaxon	**-6.974****	**-8.635†**	**-1.920**	**0.088**
Confucian	**-4.385**	**-12.328†**	**1.796**	**0.027**
LnTA	**-0.001**	**-0.000**	**-0.000**	**0.000**
Test Wald (6)	**39.97 *** **	**151.01*** **	**157.42*** **	**39.69*** **

***** < 0.005, **<0.01,*<0.05, †<0.1**

4. Conclusions

This paper is double-aimed. Firstly, we study the influence that ER and RR (such as environmental variable) have on the FP of the company in the electrical sector, and later, if the national culture of the company influences in this relationship.

Once we had the results, it can be said that both variables influence on the FP, although the results are not as resounding for ER and RR. While RR has a positive impact on the FP, regardless the measure of FP, the ER affect positively to the FP, if it is measured by the Economic Score or

Performance. These results allow us to accept Hypotheses 1a (The more ER, the better the result obtained by the company) and 2 (The more RR, the better the FP).

Finally, we had to accept the hypothesis 3 because significant differences have been identified in the relationship depending on the national characteristics of the firms. It is mainly hishlighted that in the Anglosaxon electrical firms the financial return of the environmental policies is lower than in other countries.

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Appendix 1

ENVIRONMENTAL DIMENSION	INDICATORS OR DEFINITIONS
EMISSION REDUCTION	1. Biodiversity Controversies. 2. Biodiversity Impact. 3. Climate Change Risks and Opportunities 4. CO2 Reduction 5. Discharge into Water System 6. Environmental Compliance 7. Environmental Expenditures 8. Environmental Management Systems 9. Environmental Partnerships 10. Environmental Restoration Initiatives 11. F-Gases Emissions 12. Greenhouse Gas Emissions 13. Hazardous Waste 14. Implementation 15. Improvements 16. Innovative Production 17. Monitoring 18. NOx and SOx Emissions Reduction 19. Ozone-Depleting Substances Reduction 20. Policy 21. Spill Impact Reduction 22. Spills and Pollution Controversies 23. Transportation Impact Reduction 24. VOC Emissions Reduction 25. Waste 26. Waste Recycling Ratio 27. Waste Reduction
RESOURCE REDUCTION	1. Cement Energy Use 2. Energy Efficiency Initiatives 3. Energy Use 4. Environmental Resource Impact Controversies 5. Environmental Supply Chain Management 6. Green Buildings 7. Implementation 8. Improvements 9. Land Use 10. Materials 11. Materials Recycled and Reused Ratio 12. Monitoring 13. Policy 14. Renewable Energy Use 15. Toxic Chemicals 16. Water Efficiency Initiatives 17. Water Use
ECONOMIC DIMENSION	**INDICATORS OR DEFINITIONS**

CLIENT LOYALTY	1. Anti-competition Compliance 2. Anti-competition Controversy 3. Brand Value 4. Capital Expenditure 5. Client Satisfaction Improvements 6. Consumer Complaints 7. Customer Satisfaction Transparency 8. Implementation 9. Improvements 10. Market Leadership 11. Monitoring 12. Patents 13. Policy 14. RandD Expenses 15. Receivables 16. Revenue Diversification 17. Revenue Growth 18. Revenue Quality
PERFORMANCE	1. Cost Innovations 2. Employee Cost 3. Employee Productivity 4. Employee Satisfaction Improvements 5 .Implementation 6. Improvements 7. Inventories Management 8. Monitoring 9. Net Income Growth 10. Net Margin 11. Operating Income Growth 12. Operating Profit Margin 13. Payables Management 14. Policy 15. Restructuring Expenses 16. Return on Assets
SHAREHOLDER LOYALTY	1. Accounting Compliance 2. Accounting Controversies 3. Auditor Independence 4. Cash Flow Growth 5. Debt to Equity 6. Dividend Payout Ratio 7. Earnings Restatement 8. Fitch Credit Rating 9. Implementation 10. Improvements 11. Insider Dealings Controversies 12. Liquidity 13. Long-Term Debt 14. Monitoring 15. Non-audit to Audit Fees Ratio 16. Pension Underfunding 17. Policy
ECONOMIC SCORE	The economic pillar measures a company's capacity to generate sustainable growth and a high return on investment through the efficient use of all its resources. It is reflection of a company's overall financial health and its ability to generate long term shareholder value through its use of best management practices.

Appendix 2

CLUSTER	COUNTRIES
ANGLO	Canada U.S.A. Australia Ireland England South Africa (White Sample) New Zeland
GERMANIC	Austria The Netherlands Swizterland (German Spoken) Germany
LATIN EUROPEAN	Israel Italy Swizterland (French Spoken) Spain Portugal France
AFRICAN	Zimbabwe Namibia Zambia Nigeria South Africa (Black Sample)
EASTERN EUROPEAN	Greece Hungary Albania Slovenia Poland Russia Georgia Kazkhjstan
MIDDLE EAST	Turkey Kuwait Egypt Morocco Qatar
CONFUCIAN	Singapore Hong Kong Taiwan China South Korea Japan
SOUTHEAST ASIAN	Philippines Indonesia Malaysia India Thailand Iran
LATIN AMERICA	Ecuador El Salvador Columbia Bolivia Brazil Guatemala Argentina Costa Rica Venezuela Mexico
NORDIC	Denmark Finland Sweden

Source: House et al. (2004)