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**THE FINANCIAL PERFORMANCE OF GREEN PROSPECTOR
FIRMS: A CONTINGENT APPROACH**

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Abstract

Innovation is central to improving economic productivity, human well-being and environmental conservation. Firm-level green innovation includes technological improvements that save energy, prevent pollution, or make it possible to recycle waste. Such innovation also includes green product design and corporate environmental management. This type of innovation contributes to business sustainability as it potentially has a positive effect on the firms' financial, social and environmental outcomes. However, the specific effect of green innovation on firms' outcomes can be highly influenced by the context in which firms develop their activities. Using a contingent approach and employing a sample of 88 green prospector firms from 14 different countries, we observe that the intensity of green innovation is positively related to firm profitability. We also show that stringent environmental regulations keep firms from taking the financial advantage of the benefits of green innovation. However, the environmental normative conditions in a country do not have any significant impact on the way firms take advantage of green innovation to increase their level of financial performance. Finally, we also discuss implications for academia, managers and policy-makers.

Keywords: Green innovation, environmental regulations, environmental normative dimension, contingent approach, prospector firms.

THE FINANCIAL PERFORMANCE OF GREEN PROSPECTOR FIRMS: A CONTINGENT APPROACH

1.- INTRODUCTION.

Today, it is widely recognised that firms need to act in environmentally responsible ways to contribute to social well-being and to firm-level competitiveness and financial success. For instance, Wood (2008) suggests that firms that cannot earn profits legally, ethically and responsibly do not deserve to survive, and that our planet cannot afford for businesses to continue to treat their stakeholders as just another environmental factor to be managed. Based on these considerations, it seems that business and ethics need to be jointly considered (Freeman, 2008). Moreover, ethical and responsible initiatives may be a source of valuable opportunities for firms (e.g., Porter & Reinhardt, 2007).

Green innovation has been recognised as one of the key factors for improving simultaneously the firms' environmental, social and financial outcomes (Dangelico & Pujari, 2010). Despite the growing importance of all of the benefits of green innovation for business sustainability, it makes only a small contribution to firms' innovation portfolios today (European Patent Office, 2007). The lack of green innovation may be due to the barriers to this type of innovation, including the existence of a knowledge gap, aversion to risk in capital markets, and inadequate governmental support (Runhaar, Tigchelaar, & Vermeulen, 2008). For example, several new green ventures and firms are vulnerable because they were founded with the expectation of continuing government subsidies that may not last. This is the case with the Spanish subsidies for the renewable energy. The new regulatory measures that were developed in response to the current Spanish economic problems have forced proactive environmental firms such as Iberdrola and Gamesa to reduce their expected profits for 2012 (The Wall Street Journal, 2012). These barriers have made it difficult for some managers to achieve both environmental and competitive improvements at the firm level (Hull & Rothenberg, 2008). Many firms even regard corporate environmental management as an unnecessary investment or as a hindrance to their development and growth.

In addition, even when firms overcome these barriers and develop green innovations, the latter do not always translate into high levels of financial performance (e.g., Link & Naveh, 2006). For example, consider Ringer, a producer of natural and non-toxic pesticides that reduced ecological harm but were high-priced and were less effective than conventional ones. Another example is that of the firm Deluxe Printing, which developed a new ink system called PrintWise. This system relied on petroleum-based products and solvents, used pollution-free and vegetable-based products and used water. However, the firm also implemented a high-price strategy, one that its customers were not willing to accept. Consequently, the challenges that it faced in the ink business were so difficult that it eventually sold PrintWise to a French firm (Marcus & Fremeth, 2009).

For all of these reasons, it is essential to analyse whether firm-level green innovation improves firm-level financial performance and to determine the conditions that may favour or deter such improvements. Although green innovation is incrementally important for firms, it still constitutes a small percentage of each firm's innovation outcomes. Therefore, we focus our analysis on green prospector firms, which are defined as firms that are effectively introducing new green improvements. More generally, prospectors are organisations that continually search for new market opportunities and that regularly experiment with potential responses to emerging trends in society (Miles & Snow, 1978). Consequently, these firms tend to anticipate future regulations and social trends and to design alternative operations, processes and products to prevent (rather than simply reduce) negative environmental impacts (Aragon-Correa & Sharma, 2003).

Using a sample of 88 green prospector firms from 14 different countries, we propose that the success of firm-level green innovations is significantly influenced by the context in which firms develop their activities. Indeed, the national institutional profile provides the conditions under which all organisations are able to compete and collaborate. In this study, using a contingency approach (Aragón-Correa & Sharma, 2003), we conduct two important analyses. First, we analyse whether green prospector firms that exhibit a high level of green innovation intensity are able to generate valuable resources and capabilities that improve their financial performance. Second, we study the potential moderating effect of national context on the relationship between green innovation and firm financial performance. To define this type of context, we consider the

environmental regulatory and normative dimensions, which are widely discussed in institutional theory (Kostova, 1999; Kostova & Roth, 2002; Scott, 1995). Analysis of these two dimensions can help us understand how different countries regard environmental issues, taking into account the coercive effect of environmental regulations and the way in which society protects our natural environment using different policies and collaborative mechanisms. Our results show that regulatory and normative dimensions do not have the same influence on the link between green innovation and firm-level financial performance.

This research provides insight into the increasing importance of considering the influence of the external context to explain how green innovation can enhance firm-level financial performance. Our analysis provides a holistic means of analysing under which national conditions green prospector firms are able to simultaneously develop green innovation initiatives and improve their financial performance. In addition, we try to help governments and policymakers design effective mechanisms and guidelines (rather than merely creating regulations) and thereby develop environmentally responsible attitudes.

The article is organised as follows: the next section relates green innovation to business sustainability; the third section reviews the theoretical background of our paper; the fourth section traces the development of our hypotheses; the fifth and sixth sections describe our research methodology and results, respectively; and the final section presents the main conclusions, limitations, and future research implications of our study.

2.- GREEN INNOVATION: A KEY FACTOR FOR BUSINESS SUSTAINABILITY

Sustainable development can be defined as “development that meets the needs of the present without comprising the ability of future generations to meet their own needs” (World Commission on Economic Development, 1987:43). This term is based in three pillars or principles: environmental integrity, social equity and economic prosperity (Elkington, 1998). However, the simultaneous adoption of environmental, economic, and equity principles was sometimes met with skepticism as it challenged the assumption that environmental integrity and social equity were at odds with economic prosperity (Bansal, 2005). For example, economic

prosperity can compromise environmental integrity by quickly consuming natural resources to generate high short-term profits. Despite of the business sector has been confronted with environmental and social pillars of sustainable development (Bansal, 2002; 2005; Dyllick & Hockerts, 2002; Etzion, 2007), it is now generally accepted that without corporate support, society will not achieve sustainable development, as firms represent the productive resources of the economy (Bansal, 2002).

At the firm level, business sustainability refers to those firms that manage their financial, social and environmental risk, obligations and opportunities. Previous studies have shown mixed results about the influence of these three pillars at the firm level. Whereas some studies support that socially and environmentally responsible firms increase their legitimacy, reputation and productivity, and thus improve their financial profitability (Bansal & Roth, 2000; Waddock & Graves, 1997), others maintain a more skeptical position pointing out to the large expenses related to such behaviours. In fact, the introduction of the philosophy of sustainability may involve a cost or reallocation of resources that negatively affects the firm's performance (López, García & Rodríguez, 2007). For example, firms that engage in socially responsible activities provide more informative and extensive disclosures than those which are less focused on advancing social goals (Gelb & Strawser, 2001). Indeed, social and environmental responses involve costs, such as training, product quality and safety (Waddock & Graves, 1997). Furthermore, additional expenses are incurred in research and risk prevention (López et al., 2007).

In this vein, green innovation has been recognised as one of the key factors affecting financial growth, environmental sustainability, and quality of life (Dangelico & Pujari, 2010). Green innovation can be defined as hardware or software innovation that is related to the use of green products or processes. This category of innovation includes the technological innovations that are involved in energy conservation, pollution prevention, waste recycling, green product design and corporate environmental management (Lai, Wen, & Chen, 2003). Innovation also helps to improve human quality of life and can be very profitable for firm as green innovation not only allows them to reduce inefficiency (e.g., Hart, 1995; King & Lenox, 2002; Porter & van der Linde, 1995) but also increases the demand for the firm's products among environmentally

sensitive consumers (Marcus & Fremeth, 2009). In fact, a firm that demonstrates good environmental initiative is more likely to acquire a more positive ecological reputation (Christmann, 2004) and should benefit from premium pricing and increased sales due to greater social approval (Bansal, 2005).

3.- A CONTINGENCY APPROACH TO EXPLAIN THE FIRMS' ENVIRONMENTAL INITIATIVES. HYPOTHESES DEVELOPMENT

In analysing the relationship between firm-level environmental initiatives and financial performance, the previous literature has frequently employed the contingent approach (e.g., Aragón-Correa & Sharma, 2003). This approach posits that organisational performance, including financial performance, results from the proper alignment of endogenous (internal) organisational design variables with exogenous (external) context variables (Aragón-Correa & Sharma, 2003; Burns & Stalker, 1961). As a result, it is essential to match organisational resources with opportunities and threats in the general business environment (Andrews, 1971; Miller & Friesen, 1983). Therefore, the contingent perspective is especially useful in providing a framework for explaining how the characteristics of the general business environment influence the relationship between firms' environmental practices and competitive advantage.

As Aragón-Correa and Sharma (2003) argue, the general business environment influences a firm's strategy but does not mechanistically determine it. Traditionally, the environmental management literature has used three dimensions to study business environments: environmental uncertainty, complexity and munificence (e.g., Rueda-Manzanares, Aragón-Correa, & Sharma, 2008). However, according to Hoffman (1999) and the premises of institutional theory (e.g., Kostova & Roth, 2002; Scott, 1995), it is important to take into consideration two dimensions that clearly define how different countries regard and respond to environmental issues: the regulatory and normative dimensions.

Now, we are going to separately study the direct effect of green innovation on firm financial performance and the moderating effect of national institutional conditions (the regulatory and

normative dimensions) on the relationship between green innovation and firm financial performance from an exogenous perspective.

Green innovation intensity and firm financial performance

The organisational and natural environment literature generally argues for a positive relationship between proactive firm efforts to reduce negative environmental impacts and firm-level financial performance (e.g., Hart & Ahuja, 1996; Klassen & cLaughlin, 1996; Russo & Fouts, 1997).

Several studies show that in promoting environmental proactivity, managers may be striving to positively impact firm financial performance according to different and complementary measures of corporate wealth: firm costs and firm differentiation. Through these alternative measures, these firms will be able to adopt an effective environmental leadership strategy within their internal networks.

Preventing pollution may enable a firm to eliminate environmentally hazardous production processes, redesign existing product systems to reduce life cycle impacts, and develop new products with lower life cycle costs (Hart, 1995), all of which can lower firm costs. As a result, more advanced environmental strategies can assist organisations in achieving greater organisational efficiency (e.g., Christmann, 2000; Hart & Ahuja, 1996). Firms can also gain competitive advantage in different areas of product development, including miniaturisation, weight reduction, and design for reuse and reparability (Christmann, 2004; Darnall, 2006; Henriques & Sadosky, 1996). Thus, the final result of efforts to reduce pollution is the reduction of operation costs (Christmann, 2000; Sharma, 2000).

With respect to firm differentiation, it is important to note that reducing pollution may increase the demand for a firm's products from environmentally sensitive consumers. In fact, a firm that exhibits good environmental initiative is more likely to acquire a positive ecological reputation (Christmann, 2004) and to benefit from premium pricing and increased sales due to greater social approval (Bansal, 2005). Higher levels of approval may induce environmentally conscious organisations to market their management procedures as selling points for their products and thereby differentiate their products from those of their competitors.

Hence, green prospector firms are the ones that introduce the changes into the market. Business proactivity helps firms reinforce their organisational capabilities, which in turn allows them to assume a more flexible approach in different contexts and to deepen their managers' and directors' understanding of socially complex situations (Aragón-Correa, 1998; Aragón-Correa & Sharma, 2003; Rueda-Manzanares et al., 2008).

We argue that green prospector firms are able to improve their products and internal processes and reduce their operation costs. Furthermore, they can also increase their total revenues because they are able to differentiate themselves from their competitors and gain external reputation and legitimacy. These effects will be greater for high-intensity green innovation firms because they reflect the firms' commitment to environmental issues and the relative influence of those issues on innovation activities.

Hence, we propose that the greater the green innovation intensity in green prospector firms, the greater the positive effect on their corporate financial performance.

Hypothesis 1: A high level of green innovation intensity in green prospector firms is positively related to firm-level financial performance.

The moderating effect of environmental regulations on the relationship between green innovation and firm financial performance

Regulatory pressures have been identified as a primary determinant of firm-level environmental conduct in many countries (e.g., Christmann, 2004; Henriques & Sadosky, 1996). Compared with other national institutional dimensions, the regulatory dimension is the easiest one to observe, understand, and interpret correctly because it is formalised in laws, rules, sanctions and regulations (Kostova & Roth, 2002; Scott, 1995).

The main aim of environmental regulations should be to have a growing impact on industries and to compel firms to make their processes and products greener. Such regulations may also be intended to help avoid the risk of activity breakdown, monetary losses or damage to a company's image (Dangelico & Pujari, 2010). Furthermore, regulations can even become an opportunity for

new business creation. For instance, an executive at an Italian firm stated, “*some years ago the Italian government was thinking of enacting a law forbidding the use of plastic bags, which are very pollutant. So the idea to create a company producing low environmental impact bags was born*” (Dangelico & Pujari, 2010). In the same vein, Porter and van der Linde (1995) argued that strict environmental regulations and associated compliance costs could force industries to innovate and could thus increase resource efficiency and enhance productivity. They suggested that environmental regulations could also increase turnover and profits by creating markets for environmentally improved products and technologies and that compliance costs may be offset by the gains from these innovations (called innovation offsets).

However, environmental regulations present challenges because they may be difficult to implement, may be inefficient and may be more stringent in some countries than in others. Similarly, assessments of the environmental impact of business activities are based on very long-term considerations and depend on new scientific findings that provide additional information. As a result, environmental regulations need to be continuously adjusted based on new circumstances (Engau & Hoffmann, 2011). This instability derived from environmental regulations may confuse managers and policymakers because it may often be difficult to predict the future state of the regulatory environment (Hoffmann et al., 2009).

In addressing this issue, the economic arena has debated whether more stringent environmental regulations would be more suitable than a more lax interventionist position that would promote innovation and flexibility within the business context. Some scholars have argued that less stringent environmental regulations encourage firm-level innovation and foster continual improvements in products and processes (Aragón-Correa & Sharma, 2003).

We argue that very stringent regulations create barriers to profitability for prospector firms. First, very stringent regulations lead stakeholders to consider the specifications of the law over most proactive potential behaviours. Thus, organisations lose the benefits of proactively developing green innovations and find many troubles in differentiating from competitors. Second, regulations may introduce uncertainty and profitability instability within firms. For example, regulations in the renewable energy market have created significant problems with the current profitability of

most green prospector electrical firms (The Wall Street Journal, 2012), which may make the profitability of prospector green firms more erratic.

Following this line of reasoning, we propose the following hypothesis:

Hypothesis 2: The more stringent the environmental regulations are in a country, the lower the positive relationship will be between green innovation intensity and the financial performance of green prospector firms.

The moderating effect of environmental normative level on the relationship between green innovation and firm financial performance

The normative dimension consists of “social norms, values, beliefs and assumptions about human nature and human behaviour that are socially shared and carried by individuals” (Kostova, 1997: 180). Normative aspects of institutions generally include rules of thumb, standard operating procedures, occupational standards and educational curricula. The ability of norms to guide organisational action and beliefs stems largely from social obligations or professionalisation. Kostova and Zaheer (1999) characterise the normative dimension as including tacit and deeply held structural beliefs in a society independent of the legal structure in a country.

From a normative perspective, sustainable development is absolutely obligatory (Marcus and Fremeth, 2009). From an environmental point of view, this dimension is a means for society to protect the natural environment (Hoffmann, 1999). As a result, those societies that are highly concerned about environmental issues try to encourage all of their agents (organisations, governments, non-governmental organisations (NGOs), suppliers, etc.) to pay special attention to such concerns. In fact, these agents’ commitment is required to promote environmental solutions and help the country achieve high environmental ratios. Research literature on climate change policy also speaks of the need for a broader conception of environmental governance, wherein the state is not the only key actor in policy making (Brunner, 2008; Hale, 2010). This perspective asserts that policy networks are also formed by scientific experts, industry lobbying groups, and environmental organizations (Stoddart, Tindall, & Greenfield, 2012).

Based on this reasoning, we propose that those countries with societies in which environmental issues are relevant will be able to create mechanisms and incentives that help firms to use all of the benefits of green innovation (cost reduction, firm differentiation and good relationships with stakeholders) to improve their level of financial performance.

Thus, we present the following hypothesis:

Hypothesis 3: The higher the level of environmental norms in a country, the greater the positive relationship between green innovation intensity and the financial performance of green prospector firms.

4.- METHODOLOGY

Sample

To identify the green prospector firms, we used information that was available from the European Patent Office (EPO) to identify those organisations that have registered a higher percentage of green patents during the last 20 years for each sector. The European Patent Office offers this information for 44 different sectors (for a maximum of twenty institutions per sector). We have adopted the same criteria to incorporate all of the available data into the analysis. This process allowed us to pre-select 255 institutions. From that list, we identified the total number of publicly traded firms (104 firms). The other institutions include universities, private companies and public national research institutions. We deleted those due to the impossibility of determining their financial profitability. The unavailability of financial data for some of the publicly traded firms reduced the sample to 88 firms.

The following regions and countries were included in our analysis: 21.6% of the firms were from Europe (Denmark, Finland, France, Germany, the Netherlands, Sweden, Switzerland and the United Kingdom), 21.6 % were from North America (the United States and Canada), and 56.8% were from Asia (Japan, China, South- Korea, Taiwan).

Once we selected the green prospector firms, we searched for detailed information on green innovation in the Global Patent Index (GPI). The GPI is an online database with 100 searchable fields and 70 million patent records from more than 80 patent offices, including the United States Patent and Trademark Office (UPTSO), the European Patent Office (EPO) and Japan. We also obtained financial information from Compustat Global Database. Finally, information on national institutional conditions was obtained from the Environmental Sustainability Index (ESI) in 2005 (Esty, Levy, Srebotnjak and Sherbinin, 2005).

Measures

Financial performance (dependent variable): We measured firm financial performance by calculating return on assets (ROA) for two consecutive years (2007 and 2008). The change in ROA is expressed as a percentage. The firm financial performance information was acquired from the Compustat Global database. ROA is usually employed as a proxy of financial performance in environmental management literature (Russo & Fouts, 1997).

Green innovation intensity: We calculated for each firm the percentage of the total patents registered in 2007 that could be considered green patents. Patent data have been treated as the most important indicator of innovation as they contain standardised information relating to new ideas and technological development (Frietsch & Grupp, 2006). The degree to which innovations are protected by legal and other mechanisms influences the degree to which firms profit from innovation (Teece, 1986). The EPO cooperated with the United Nations Environmental Program (UNEP) and the International Centre on Trade and Sustainable Development (ICTSD). As a result of that collaboration, the Y02 patent classification was created. Hence, in this research, we consider the green patents to be those that have been assigned the Y02 code.

The stringency of environmental regulations: For this purpose, we considered the variable 'Environmental Governance'. This variable was proposed by the World Economic Forum and is included in the ESI 2005 (Esty et al., 2005). It contains and aggregates specific information on several aspects of regulatory stringency: air pollution regulations, chemical waste regulations, the clarity and stability of the regulations, the flexibility of the regulations, innovation in

environmental regulations, leadership in environmental policy, consistency of regulation enforcement, toxic waste disposal regulations and water pollution regulations.

Environmental normative levels: Because environmental norms reflect the wider societal values of a country (Parsons, 1960), we analysed how the public sector addresses environmental issues. The public sector plays an essential role in a country; one of its main tasks is to create social policies and incentives that will improve the national economic climate and to provide mechanisms for protecting the natural environment and quality of life. Specifically, we considered the variable ‘Funding’, which was included in the ESI 2005 (Esty et al., 2005). The indicators for this variable reflect the contribution of the public sector to international and bilateral funding for environmental projects and to development aid (Organisation for Economic Cooperation and Development, 2005). It is felt that a nation’s participation in environmental and development assistance programs, either as a donor or as a recipient, is an important sign of government and societal commitment to environmental sustainability.

In addition, we have included the following control variables:

Type of industry. There may be incentives for firms to conform to environmental industry codes. These codes can influence environmental management practices because they can produce a form of peer pressure from other firms within the industry (Lenox & Nash, 2003). The firms in the sample are assigned to four different industries based on their economic functions and internal characteristics: material (chemical, metal and mining), industrial (aerospace, electrical equipment, machinery and automobiles), personal health (personal product, health care, pharmaceutical and food) and technology (software, technology hardware, semiconductors and photographic products). We introduced dummy variables to control for the sector.

Firm size. Organisational size has been shown to be an important determinant of firm-level environmental conduct. (Aragón-Correa, 1998). Furthermore, economies of scale are one of the structural determinants of corporate outcomes (Christmann, 2004). We control for firm size using the total net revenues reported on each firm’s balance sheet in 2007.

Firm level of innovation. We control for the firm's level of innovation using the total number of patents registered in 2007 expressed in hundreds of patents. The total number is a proxy measure that helps us to determine the degree of innovation within the firm (Penner-Hahn & Myles-Shaver, 2005).

Prior financial performance. Profitability may change with the attention given to environmental issues and, more specifically, according to whether or not environmental issues are perceived as threatening (Etzion, 2007; Sharma, 2000). We used the ROA average from the three previous years.

5.- RESULTS.

To test the hypotheses described above, we used a multiple and moderated regression analysis that introduced the moderating effect as a multiplicative variable (Cohen & Cohen, 1984). We first assessed the probable extent of the common method variance, the conformity of our data distribution with the assumptions associated with our analytical tools, and the extent of the multicollinearity among the independent variables. To create the multiplicative terms, we fixed both the independent and the moderating variables to their means to avoid multicollinearity (Venkatraman, 1989). Our analyses of condition indices and variance inflation factors (VIFs) showed that multicollinearity was not an issue in our models (Hair, Andersson, Tatham, & Black, 2009).

Table 1 shows the descriptive statistics and correlations. As we can see from the table, green innovations represent 4% of total firm patents on average, even for green prospector firms. The total number of patents is 649 on average.

Table 1. Descriptive Statistics and Correlations^a

Variable	Mean	S.D	1	2	3	4	5	6	7	8	9
1. Financial performance	-3.52	5.30									
2. Materials	0.20	0.41	.03								
3. Technology	0.10	0.30	-.03	-.17†							
4. Pharmaceutical	0.10	0.30	.20*	-.17†	-.11						
5. Firm size	3.45	12.22	.02	-.07	.13	-.09					
6. Prior financial performance	0.10	0.07	-.17†	.01	-.23*	.32**	-.10				
7. Innovation level	6.49	8.69	.05	-.23*	.14†	-.16†	.12	-.04			
8. Green innovation	0.04	0.10	.21*	.08	-.02	-.12	.00	-.21*	-.05		
9. Stringency of environmental regulations	51.61	4.03	.20*	.06	-.11	.13	-.37***	.02	.02	.09	
10. Environmental normative levels	67.71	40.31	-.22*	.16†	.07	-.08	-.18*	-.20*	.00	.03	.38***

^an=88. The table lists the Pearson's correlation coefficients. Significant at the †.10; * .05; ** .01; *** .001 level.

Table 2 shows the results of the regression analyses testing the hypotheses. The control variables were entered in Model 1. Model 1 shows that those firms that belong to the pharmaceutical sector better improved their financial performance than did those in other sectors during the analysed period. In contrast, the firms' prior financial performance is negatively related to improvements in financial performance. The other control variables were not significant for the sampled firms.

Table 2. Results of the Regression Analyses^a

	Model 1		Model 2		Model 3		Model 4					
			VIF		VIF		VIF					
Control variables												
2. Materials	1.10	(1.45)	1.14	1.28	(1.43)	1.15	0.69	(1.42)	1.18	1.89	(1.40)	1.18
3. Technology	-1.15	(1.91)	1.11	-0.94	(1.89)	1.12	-0.60	(1.84)	1.13	-0.43	(1.82)	1.13
4. Personal health	5.52**	(1.92)	1.21	5.71**	(1.96)	1.21	4.96*	(1.94)	1.25	5.79**	(1.88)	1.21
5. Firm size	.01	(0.05)	1.04	.01	(0.05)	1.04	0.05	(0.05)	1.21	-0.01	(0.05)	1.09
6. Prior financial performance	-22.15*	(8.80)	1.17	-18.91*	(8.85)	1.22	-14.95†	(8.78)	1.27	-22.68**	(8.69)	1.27
7. Innovation level	0.07	(0.07)	1.12	0.08	(0.07)	1.12	0.06	(0.07)	1.15	0.09†	(0.06)	1.13
Independent variables												
Green innovation				10.28†	(5.62)	1.06	18.08*	(6.99)	1.74	9.06†	(5.45)	1.08
Stringency of environmental regulations							0.29†	(0.15)	1.28			
Environmental normative levels										-0.04**	(0.01)	1.12
Green innovation* Stringency of environmental regulations							-1.89*	(0.94)	1.47			
Green innovation * Environmental normative levels										-0.23	(0.20)	1.05
Constant	-2.44†	(1.27)		-3.27*	(1.32)		-3.82**	(1.31)		-3.96*	(1.23)	
<i>R² adjusted</i>	.06			.09			.13			.16		
<i>F(dl)</i>	1.90†	(6)		2.16*	(7)		2.48*	(9)		2.76**	(9)	
<i>ΔF(dl)</i>	1.90†	(6)		3.35†	(1)		3.19*	(2)		4.28*	(2)	

^a *n*=88. The table contains unstandardised regression coefficients. Standard errors are in parentheses.

Significant at the †.10; * .05; ** .01; and *** .001 levels.

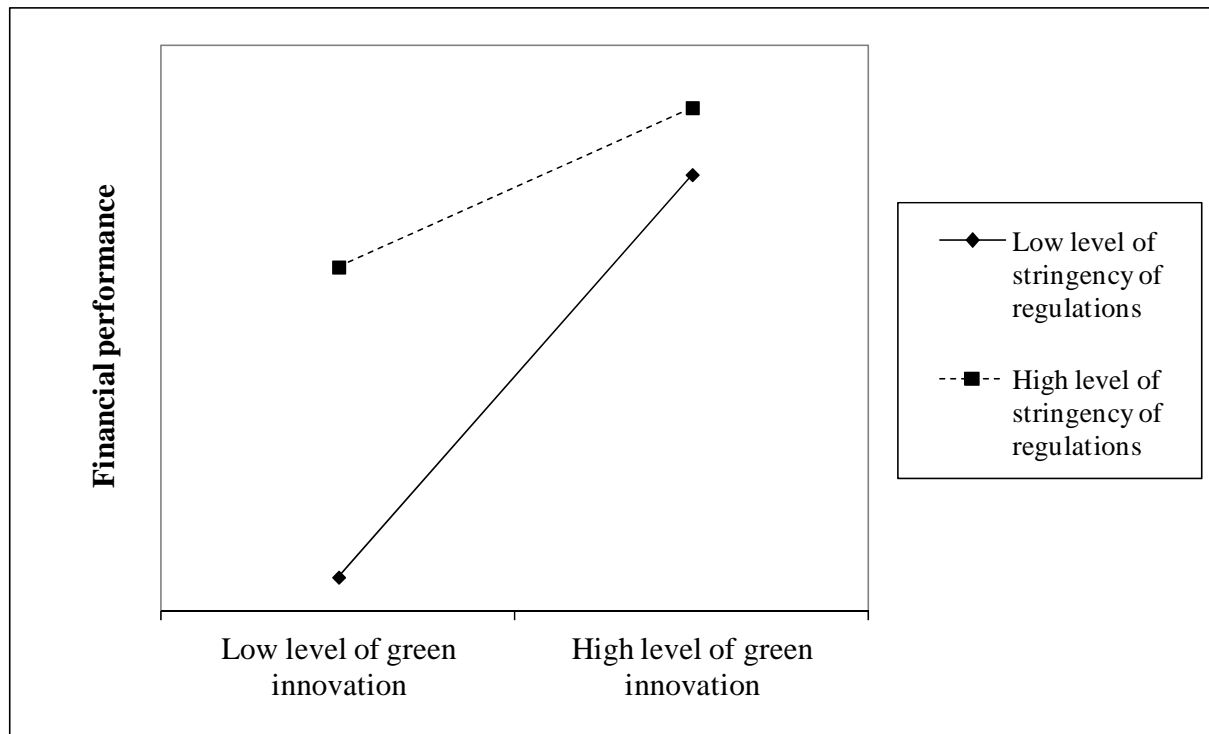
Dependent variable: Firm financial performance.

Model 2 reflects the effects of green innovation intensity. This model shows that green innovation significantly and positively affects firm-level financial performance. Hence, hypothesis 1 is accepted.

Model 3 shows the moderating effect of the stringency of regulations on firm financial performance. The model shows that the former imposes a negative moderating effect on the relationship between green innovation and firm financial performance. Indeed, the greater the stringency of the environmental regulations in a country, the lower the probability that green innovation will lead to better firm-level financial performance. Hence, hypothesis 2 is supported by our data.

Figure 1 clarifies this moderating effect.

Figure 1. The moderating effect of the stringency of environmental regulations on the relationship between green innovation and firm financial performance



Finally, Model 4 shows that the environmental normative level does not impose any significant moderating effect on the relationship between green innovation and firm financial performance. Consequently, hypothesis 3 is not supported.

In summary, we observe that while hypothesis 1 and 2 are supported by our data, hypothesis 3 is not.

6.- DISCUSSION AND CONCLUSIONS

Green innovation has been increasingly emphasised by policy makers and academics alike as a mechanism for effectively solving environmental problems (Kiviima, 2008) and enhancing firm sustainability. Entrepreneurs expect these types of innovations to generate a good rate of market diffusion and high profits and, simultaneously, to improve the natural environment (Hillary, 2000). As a result, firms that are pioneers in terms of green innovation should enjoy a ‘first mover advantage’ (Nehrt, 1996) that should allow them to charge a higher price for green products (Chen, 2008), improve their corporate images, develop new markets, gain competitive advantage (e.g., Aragón-Correa & Sharma, 2003), and incorporate social, environmental and ethical issues in their management decisions (Hann & Figge, 2011). However, real experience shows that green innovation does not always even increase firm-level profits; the literature shows that business failures can result from green innovation (Marcus & Fremeth, 2009).

Using a contingent perspective, this paper provides evidence of the relationship between green innovation and firm-level financial performance in the case of green prospector firms and determines whether this relationship might be influenced by the social context in which firms operate. To determine this social context, we consider the regulatory and normative dimensions, which are widely recognised as important in institutional theory (Kostova, 1999).

We combined information from different databases. First, the European Patent Office database, which offers data on green prospector firms. Second, we also obtained specific green intensity information from the Global Patent Index (GPI). Third, Compustat Global, which offers financial

information on the firms in our sample. Finally, our information on national institutional conditions was obtained from the Environmental Sustainability Index in 2005.

Our results show that green prospector firms that exhibit a high level of green innovation intensity are able to enhance their corporate financial performance. This may be because, through green innovation, such firms are able to improve their financial performance via cost leadership and product differentiation.

Second, our results show that the stringency of a country's environmental regulations negatively moderates the relationship between green innovation and firm financial performance. Very stringent environmental regulations create fewer advantages due to intense green innovation because it is challenging for such firms as to distinguish themselves from other firms. The innovators must recoup the costs associated with prospecting, including the cost of investment in research, the cost of opening a new market and the cost of educating consumers and stabilising the technology (Lieberman & Montgomery, 1988). In essence, in countries with a high level of regulation, stakeholders (especially consumers and governments) may pay more attention to the firms' levels of adherence to environmental regulations than to innovative firm initiatives related to environmental issues. In contrast, less stringent environmental regulations allow firms to be prospectors, distinguishing them from their competitors, and make it possible for them to gain sustainable competitive advantage due to green innovation. This then improves these firms' financial performance via increases in revenues and improvements to their internal processes.

Finally, we find that the normative dimension does not impose any significant moderating effect on the relationship between green innovation and firm financial performance. This might be because the majority of societies still pay too much attention to environmental regulations. Today, societies are required to create proper conditions through different policies (i.e., subsidies, incentives) beyond what is required by the law. Hence, social mechanisms should help firms to develop new environmental initiatives and can reward environmental entrepreneurs who assume high risk and costs to implement green innovation.

Governments, public agents and NGOs should play important roles in creating the institutions and social mechanisms that encourage firms to develop socially and environmentally responsible policies while simultaneously improving their financial performance. Accordingly, policymakers must create the proper external conditions for firms to develop advanced environmental initiatives that will help them achieve superior financial performance. Regulatory measures are not the only mechanisms that can encourage firms to be environmentally proactive; there may also be other complementary and effective alternatives. As Marcus and Fremeth (2009: 22) argue, “government’s role means more than just regulatory enactments that command firms to act and punish them for refusing to act in accord with government requirements”. Governmental policies are not simply legally binding mandates imposed on firms and other polluters; they may also include policies and programs such as voluntary government/industry agreements, joint research and development efforts, government information dissemination programs, grants, subsidies, transfers, taxes and other program initiatives.

In addition, it is very important to improve and support the mechanisms through which firms communicate their environmental performance to society. Businesses will attempt to improve their environmental outputs if they are conscious that their society values such outputs and if they can broadcast their actions. Despite the growing efforts to make the environmental outcomes of firms more transparent (i.e., through the Toxics Release Inventory or the European Pollutant Releases and Transfer Registers), significant information deficiencies persist (Delgado-Ceballos & Rueda-Manzanares, 2010). Greater governmental efforts in this area would increase the incentives of the firms to improve their green proactivity. Governments that focus on improving the availability of information regarding firms’ environmental practices would intensify the positive effect of differentiation through green innovation.

From a managerial point of view, this study suggests that top management commitment and support is essential for the development and implementation of green innovation. Managers and CEOs should also focus on identifying national opportunities and integrating advanced environmental initiatives into the overall strategy of their firms, as doing so may yield superior financial results. Our findings should convince high-tech firms that are already noteworthy for

their product and service innovation to make their operations and product lines more environmentally efficient.

The findings presented in this paper should also be interesting to the community. If firms attempt to develop green innovations, they may help to decrease the level of greenhouse gases emitted, to guarantee the preservation of the environment, and to improve programs that reduce the impact of firm-level activities on the environment. Firms may even chose to use renewable energies. These efforts would contribute to the welfare of the environment and to social well-being.

We acknowledge that this study has several limitations. First, we used cross-sectional data. Future analyses can benefit from using data collected over a long period of time. Second, patents are not the only mechanisms for protecting innovations; lead time, industrial secrecy, complex specifications can also have an impact in this regard (Cohen, Gould, & Bentur, 2000; Frietsch & Schmoch, 2006), or firms' improvements in terms of environmental management processes. However, there are very few examples of economically significant inventions that have not been patented (Dernis & Guellec, 2001). Third, we focus on prospector firms. Future research might conduct such analyses for all kind of firms.

In future research, in order to further extend this transnational study, researchers might conduct a detailed exploration of green innovation in firms from other countries (especially African countries).

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