

RESEARCH ON ENVIRONMENTAL MANAGEMENT IN COMPANIES IN SPAIN (1993- 2003)

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Abstract:

The objective of this paper is to analyze the evolution and the main characteristics of the environmental business management research in Spain over the years 1993- 2003. In order to gain an insight into existing Spanish environmental business management research this paper profiles the literature on environmental business management from leading Spanish management journals and the papers of Spanish authors in the leading international journals . So, this paper shows a review of the literature to help new researchers in this topic and/or to identify new research lines.

1. Introduction

Throughout history, Technology, Science and Society have shared the role of being the driving factors in the development of humanity. Sometimes, it has been technological development that has motivated changes in science and social behavior; Think, for example, of the industrial revolution or the current information technology revolution. Other times, however, it has been science that has forced the development of new technologies that, in turn, modify social habits more or less quickly. For example, scientists' desire for knowledge of the universe fueled a technological race among the great powers to conquer space.

Finally, in other cases, it is social pressure that imposes scientific and technological development, to end up transforming the context in which human life unfolds. It is in this third situation that the environmental movement that has permeated a more or less large part of the societies of developed countries in recent decades can be framed . Social concern about the deterioration of the natural environment (global warming , climate change , loss of biodiversity, high volumes of waste, etc.) has been the real driver of productive technologies cleaner and new scientific branches concerned with finding approaches to the problem and potential solutions to it.

The multidisciplinary nature of ecological issues has given rise to the birth of new scientific branches or specialties in a great diversity of sciences. From Biology to Engineering . _ From Chemistry to Law or Sociology . _ _ And Economic Science has not been an exception . Today Nowadays, economists can find research fields classified as Ecological Economics , Natural Resources Economics , Green Taxation , Ecological Public Accounting or Corporate Environmental Management .

This last field is where the present work is framed, which tries to analyze the evolution and methodological characteristics of research on this subject in Spain during the last decade (period 1993-2003). Likewise, this work allows us to identify the main topics of interest in this area of research.

The completion of the work has been based on numerous previous works that have tried to analyze the state of research in other areas of knowledge in Spain. It is worth highlighting the works of Gutiérrez (1995) on business management; by Rodríguez and Ayala (1995) on financial economics, by López Gracia (1995), García, Laínez and Monterrey (1995),

and Ripoll and Tamarit (1996) on topics related to accounting; by Claver and González (1998) on information systems; de Guerras and others (1999) on business economics ; by Díez de Castro (1995), Luque (1995), Váz-

Quez (1996) and Vallet and others (2002) on various aspects of marketing; by Domínguez (1995) and Nieto (1998) on operations management; and that of Molina and others (2003) on quality management.

The objective of this work is to analyze the current state of research on environmental management in companies at the national level , for which We have carried out a study of the works published in the main existing journals at the national level and of the publications of national authors in international journals. The ultimate purpose of this work is for new researchers in this subject to have a compendium of the existing literature, in order to begin their research work and contribute new knowledge to the field of environmental management of the company . In addition, this work will identify the main national journals that researchers of this line can used when disseminating the results of their research.

For this purpose, the rest of the article is structured as follows: first, the methodology followed when creating the database of articles to be analyzed is described, and then the main research topics on environmental management are described. identified from the analysis of specialized literature; In the next section the main results of our study are analyzed, finishing the work with a section of conclusions and final reflections.

2. Research methodology _ _

The research sources of this study are made up of a set of Spanish journals that may include works in the field of environmental management

in companies. Works presented at conferences and doctoral theses have been excluded because it is understood that quality studies end up being published in specialized journals and that these publications are precisely the most cited in scientific works, coinciding on this point with most previous studies carried out internationally (Stahl et al., 1988; Bairam, 1994).

The next step was to select which scientific journals to analyze. We have considered that the journals to be analyzed should be widely disseminated at a national level, recognized by researchers as relevant and that they should cover the different works on environmental management that are published from the different fields of business economics. In this way, the initial list of journals arises from those proposed in previous studies (Guerras et al., 1999; Cerviño et al., 2001; Molina et al., 2003).

To complete the list, following the methodology proposed by García Merino and others (2000), we proceeded to review the catalogs of the national libraries and the lists of journals considered as a basis for the evaluation of research activity in the different evaluation agencies. , looking for other magazines that, due to their editorial line, were likely to include works on environmental management. As a result of this analysis, the preliminary list was expanded with the following journals: Financial Analysis, Management and Progress, Financial Studies , Harvard-Deusto Finance and Con-

TABLE 1.— *List of journals included in the study*

MAGAZINE	NUMB ER OF
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**Technology Journal of Management , Accounting and
Economics (TECH)**

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	ARTIC LES
1.- Financial News	7
2.- Senior Management	9
3.- Financial Analysis	0
4.- Economic Studies Bulletin _	6
5.- ICE Economic Bulletin	14
6.- Economics Notebooks	0
7.- Economics and Business Management Notebooks _ _ _	3
8.- Economic Information Notebooks	0
9.- ICE Economic Notebooks	0
10.- Management and Organization	5
11.- Direction and Progress	0
12.- Distribution and Consumption	12
13.- Industrial Economy	7
14.- Economists	1
15.- Esic Market	14
16.- Financial Studies	1
17.- Consumer Studies _	5
18.- Harvard - Deusto Business Review	6
19.- Harvard - Deusto Finance and Accounting	2
20.- Harvard - Deusto Marketing and Sales	1
21.- Spanish Commercial Information	7



22.- Research and Marketing (from AEDEMO)	10
23.- Economic Research	1
24.- European Research on Business Management and Economics _	7
25.- Management	0
26.- MK Marketing + Sales	0
27.- Currency and Credit	0
28.- Spanish Economy Papers _	1
29.- Double Game	14
30.- Perspectives of the Financial System	0
31.- Accounting Magazine _	2
32.- Journal of Applied Economics	0
33.- Magazine of Economics and Business	2
34.- Spanish Journal of Agrosocial and Fisheries Studies _	3
35.- Spanish Journal of Economics	0
36.- Spanish Magazine of Financing and Accounting	fifteen
37.- Spanish Journal of Marketing Research (ESIC)	2
38.- European Journal of Business Management and Economics _ _	8
39.- Accounting Technique	12
40.- TOP, Spanish Journal of	0

Operational Research	
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tability, M@n@gement, Accounting Magazine and TOP (Spanish Operational Research Magazine). In this way, a list of 40 journals collected in table 1 has been prepared.

We have eliminated from our research short notes, introductions, editorials, professional comments and book reviews , common in some of the journals analyzed but which cannot be classified as published articles . Like Molina and others (2003), we have chosen to include articles that appear in monographic issues on environmental management . in the company, since although they could distort the results by focusing on a specific topic, we believe they reflect the researchers' interest in the topic under study and the need to delve deeper into it. Likewise, works that are translations of studies published in other international journals have not been considered, as occurs in some journals such as Harvard-Deusto Business Review, considering, therefore, exclusively original research articles.

Our analysis extends to the period 1993-2003. We understand that this is a sufficiently broad temporal scope to reliably analyze the trends in the evolution of research carried out in Spain, since although there are articles on environmental management prior to 1993, we agree with Guerras and others (1999) considering that it is in recent years that the incorporation of external evaluators has become widespread in most journals, which ensures a certain degree of rigor in the review of the works published in them.

Following the previous criteria, each of the three authors separately analyzed the index of each issue of the journals considered and decided which articles had the desired topic by evaluating the title, keywords, abstract and, in case of doubt, the content. thereof. These analyzes were

subsequently grouped, with a coincidence in 89.2% of the cases. In cases of disagreement, each opinion was debated until an agreement was reached. In this way, a database of 177 articles published in 28 different journals is obtained. However, we must point out that in some cases there is difficulty when classifying certain articles, so despite our efforts, this assignment has a certain subjective nature.

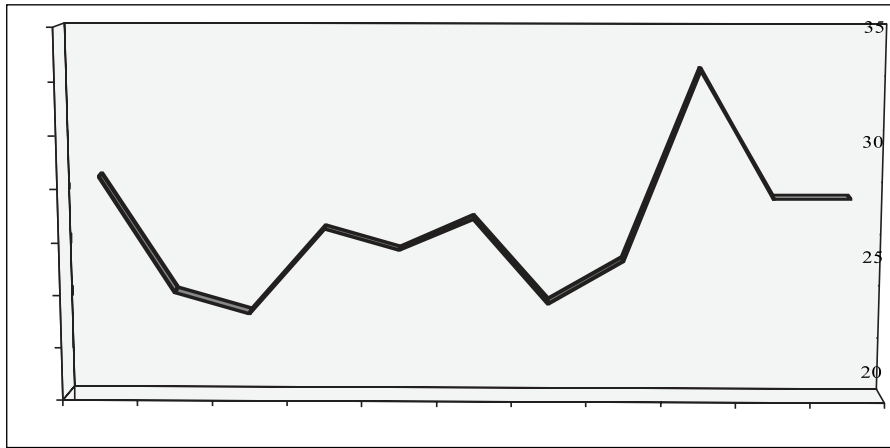
Once the database was established , each article was analyzed based on __ a data collection sheet that included information related to the origin of the authors, the research topics covered and the research methodology used. To determine the main existing lines of research in the field of environmental management in the company, each of the authors of the work, independently, proposed a list of topics that were subsequently reviewed jointly until reaching a consensus. In this way, the topics included in our work are the following seven: financial management and environmental accounting, consumer behavior, environmental management (general), environmental management (strategies and attitudes), ecological marketing, production/operations and management systems environmental (SGMA)/certification/audit.

When determining the research topic of each article, the abstract and/or the main body of the article was reviewed. This review was carried out independently by each of the members of this research team . Most of the articles were clearly classified into one of the different research topics previously defined, however 9% of them were considered doubtful or were classified differently by each member of the team . In these cases, a new review was carried out and the most appropriate classification was jointly debated.

3. Results

Regarding the temporal evolution of the works, we can see (figure 1) how there was a decrease in the number of works on environmental management during 1994 and 1995, and from then on it grew, reaching its maximum in 2001 with 31 articles published, and there has been a slight decrease in the last two years. We must take into account that in 2001 two monographic issues on environmental management were published (Senior Management and Double Entry). which partly explains the large number of articles published in that year. In this regard, we can point out that throughout the period analyzed, several magazines have dedicated monographic issues to environmental management, which constitutes another symptom of the importance that the scientific community attaches to this type of work. In relation to the type of published works , we observe a clear majority of theoretical works without any type of empirical application (62.1%) compared to works with some type of empirical treatment . It is also interesting to check the clear increasing trend throughout the period considered in the number of articles of an empirical nature in relation to those that are merely conceptual . Thus , we went from 23.8 % of empirical works in 1993 to 52.6 % in the _

FIGURE 1.— *Temporal evolution of the articles*



year 2003. These differences show a significance level of 5 %.

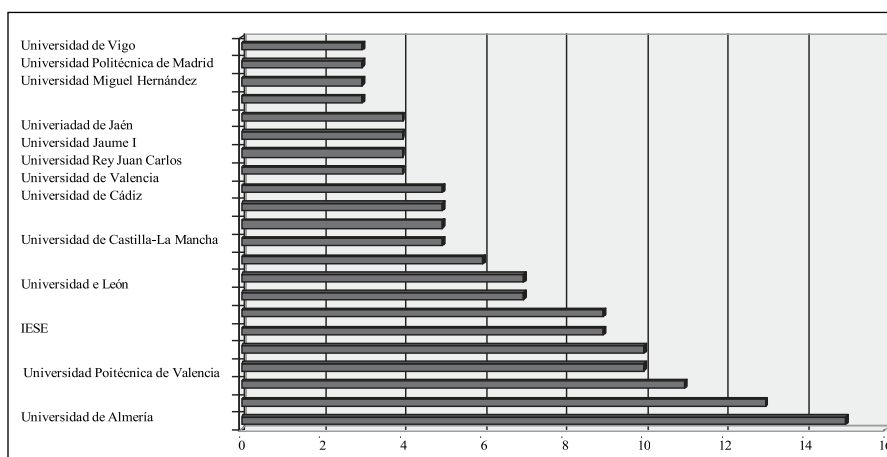
Regarding the number of authors who sign each work, a certain tendency is observed towards individual work (46.9%) as opposed to team work. Significant differences are detected between conceptual and empirical works, with the presence of individual works being greater in the case of conceptual works (58.2%) than in empirical works. Thus, we observe how empirical works tend to bring together a greater number of authors to carry them out, specifically an average of 2.16 authors compared to 1.58 in theoretical works. Finally, we can highlight that in the case of teamwork, these are usually 2 people (33.3%).

Regarding the origin of the authors, there is a clear predominance of works coming from the university environment (88.7%) compared to those from the business and institutional world. Furthermore, in the case of work teams, there is a scarce presence of teams with members from different organizations (13%) and even fewer with members of different nationalities (2.3%). We also observed that empirical works tend to present greater inter-organizational collaboration (22.38%) than those of a purely

theoretical nature (7.3%), differences that are significant at 95% confidence level .

The research centers that have made the greatest number of contributions are the Complutense University of Madrid, the University of Oviedo, the Public University of Navarra, the Carlos III University and the University of Granada with 10 or more articles in the period analyzed (see figure 2 ¹).

FIGURE 2.— *Research centers by number of publications*



¹ The figure only shows research centers with more than 2 publications on environmental management.

Table 2 presents the evolution of the different research topics identified throughout the period analyzed. We can see how the main topics discussed throughout the decade have been *financial management and environmental accounting* (28.2%), *ecological marketing* (20.9%), *environmental management (general)* (14.1%), *consumer behavior* (13.6%),

behavior _												4
Environm ental accounting	7	1	2	5	6	5	4	1	e l e v e n	5	3	f i f t y
Environmen tal manageme nt (Strategy and attitudes)	1	0	1	0	2	2	0	1	4	3	2	1 6
Environme ntal manageme nt (General)	6	1	0	5	1	3	1	1	6	2	0	2 8
Green Marketing	6	6	2	5	3	2	0	2	2	2	6	3 6
Production / Operations	0	1	0	0	0	1	1	0	3	2	1	9
SGMA / Certificati on / Audit	0	1	1	0	0	0	2	6	3	1	2	1 6

Total	t	1	8	1	1	1	9	1	3	1	1	1
	v	0		6	4	7		3	1	9	9	7
	e											7
	n											
	t											
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	-											
	o											
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	e											

The main research topic, *financial management and environmental accounting* , has focused mainly on analyzing the way in which accounting should measure, value, quantify and report on the qualitative and quantitative aspects that can influence decision making about actions on environmental variables. This topic has been one of the most discussed since the beginning of the period analyzed, with no substantial change in the number of published works, which are mostly theoretical in nature (only 34 % can be considered empirical). . The research centers that have carried out the greatest number of works contributed to this line are the Carlos III University, the University of Castilla La Mancha, the Rey Juan Carlos University and the University of Zaragoza.

The second most discussed topic is what we have called *ecological marketing* . This includes different works on the design, planning and execution of a product, price, distribution and communication policy that minimizes the impact caused on the environment. We observe little empirical content on this topic, since only 21.6% of the works can be

considered as such. It is observed that although this line of research seemed to have been losing prominence over the years, in 2003 it once again recovered the levels of the first years of the period analyzed. It is worth highlighting in this case the investigations carried out at the Complutense University of Madrid and Extremadura.

The next most studied topic is *environmental management (general)* , which includes works related to the current state of environmental management in Spain , the assessment of the environmental impact of activities

business, the use of environmental technologies available to the industry and the impact of environmental investments on business results, among others. Only 36% of the works analyzed are empirical in nature and we can see how this line seems to have lost weight in the last two years, giving way to works on issues of a more specialized nature. On this topic we can highlight the contributions of the universities of Oviedo, Granada and Seville.

The fourth topic by quantitative importance is *consumer behavior* , a topic that we have differentiated from ecological marketing, due to its importance and entity. It includes work related to consumer decision-making regarding the purchase of ecological products, identifying consumer segments in relation to the environmental variable and trying to define their sociodemographic and psychographic profile. It should be noted that the majority of these works focus on studying the attitude, intention or behavior of consumers regarding organic farming products, with 70.8% being empirical in nature. We can highlight the work of the Public University of Navarra and the University of Zaragoza.

In fifth position appears the topic *environmental management (strategy and attitudes)* with 8.84% of the articles analyzed (56.3% of them can be considered empirical), which includes those works that analyze the different environmental strategies of companies. , as well as the attitude of businessmen towards the main environmental problems of society. This line has experienced a notable increase in work in the last years of the period analyzed, highlighting the work of the University of Oviedo.

Next appears the topic *SGMA/certification/audit* with the same percentage as in the previous topic and 31.3% of empirical works. This line includes work that analyzes the implementation of environmental management systems in the company, its integration with quality management and occupational risk management systems, and ecological certifications (ISO 14001 and EMAS Regulation). and environmental audits or eco-audits. As in the previous case, there has been a growing interest in this line in the last three years.

Finally, the line that we have called *production/operations* (5%) appears, where the impact of the design of new products and services on the environment, reverse logistics and, in general, the relationship of operations management with environment. 22.2% of the analyzed works are empirical.

Regarding *works of an empirical nature* , the data used may come from secondary sources (databases or company registries) or have been collected specifically for the work in question. In the period considered, 74.62% of the articles considered empirical use information from primary sources, and we observed a preponderance of quantitative studies, based on commercial research (84.84%), compared to those of a qualitative nature , based fundamentally on case studies

(12.12%). 66.12% of the *information sources* are based on surveys and 22.58% on direct observation. Other data collection techniques used are in-depth interviews (4.84%), experiments (4.84%) and data panels (1.61%). Of the studies that use surveys, the majority are postal (53.7%) and the rest are personal surveys, it is striking to see that the distribution of surveys via the Internet or telephone has not been used on any occasion. Regarding the *unit of analysis* used in each study, the data coming from companies (56.45%) stand out, followed by those coming from people (37.09%).

Regarding the *temporal scope* of the empirical studies, those of a transversal nature stand out (78.26%) compared to those of a longitudinal nature. In terms of *geographical scope*, there is a greater presence of articles of a national nature (its population refers to the whole of Spain) (50.79%), closely followed by works of a local or regional scope (46%). Of the articles analyzed , only 2 use international data . _

Another interesting result is related to the *information analysis techniques* used in each article. 31.3% of the articles analyzed exclusively use descriptive statistics techniques, 16.4% use factor analysis techniques, 13.43% regression analysis and 11.9% cluster analysis. However, we must point out that in most works several analysis techniques are usually used together.

To finalize the analysis of the results, we have tried to classify *the journals according to their profile* , thus identifying the orientation of each journal in relation to the type of articles published and based on some of the indicators used in this work. . Specifically, Table 3 has considered the research topic, the empirical nature of the published works, the average number of authors and the impact index of the journal according to the IN-RECS indicator of 2004 (<http://ec3.ugr.es/in-recs/>). At no time do we intend for this classification to imply an assessment of each magazine, since each one is aimed at different segments of the public and has its own editorial line, but rather

We only intend that this classification serve as a reference for authors who in the future try to publish on topics related to environmental management in the company.

3.1. PUBLICATIONS BY NATIONAL AUTHORS IN INTERNATIONAL JOURNALS

⌘ This research would be incomplete if it did not include an analysis of the works on environmental management in the company, published by Spanish authors in international journals, and thus be able to describe a more precise overview of the state of research on this subject in our country. . In this way, we proceeded to analyze the publications made by national authors in international journals, specifically those included in the Journal of Citation Report (2003). The result of this analysis shows only 14 works in the study period , of which half also

TABLE 3.— *Profile of the magazines*

Magazine	C o n s u m er b e	E n vi r o n m e nt	E n vi ro n m en tal m an	E n v ir o n m e n	G r e e n M a r	P r o d u c t i o	SG M A/ Ce rtif ica tio n/ Au	% E m p i r i c a	A v e r a g e n
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	h a vi or –	al a c c o u nt in g	ag e m en t (S tr at eg y an d att it u de s)	ta l m a n a g e m e n t (G e n e r al)	k e t i n g	n / O p e r a t i o n s	dit	l W o r k s	u m b e r o f a u t h o r s
Financial News	0. 0 0 %	7 1. 4 3 %	0. 0 0 %	2 8. 5 7 %	0 . 0 0 %	0 . 0 0 %	0.0 0 %	5 7 . 1 4 %	1 . 5 7
Senior Management	0.	0.	1	5	0	1	22.	2	1

	0 0 %	0 0 %	1. 1 1 %	5. 5 6 %	. 0 0 %	1 .1 1 %	22 %	2 .2 2 %	. 4 4
Economic Studies Bulletin _	0. 0 0 %	0. 0 0 %	3 3. 3 3 %	5 0. 0 0 %	1 6 .6 7 %	0 .0 0 %	0.0 0 %	3 3 .3 3 %	1 .5 0
ICE Economic Bulletin	2 1. 4 3 %	7. 1 4 %	0. 0 0 %	7. 1 4 %	3 5 .7 1 %	1 4 .2 9 %	14. 29 %	2 1 .4 3 %	1 .5 0
Notebooks on Economics and Business Management _ _	0. 0 0 %	0. 0 0 %	3 3. 3 3 %	3 3. 3 3 %	0 .0 0 %	3 3 .3 3 %	0.0 0 %	6 6 .6 7 %	2 .0 0
Management and Organization	0. 0 0 %	0. 0 0 %	2 0. 0 0 %	0. 0 0 %	4 0 .0 0 %	0 .0 0 %	40. 00 %	4 0 .0 0 %	2 .4 0

			%		0 %	%		0 %	
Distribution and Consumption	3 3. 3 3 %	0. 0 0 % 	0. 0 0 % 	0. 0 0 % 	6 6 . 6 7 %	0 . 0 0 % 	0.0 0 % 	3 5 . 7 1 %	1 . 7 5
Industrial Economy	1 4. 2 9 %	0. 0 0 % 	1 4. 2 9 %	5 7. 1 4 % 	0 . 0 0 % 	1 4 . 2 9 %	0.0 0 % 	5 7 . 1 4 %	1 . 5 7
Economists	0. 0 0 % 	1 0 0. 0 % 	0. 0 0 % 	0. 0 0 % 	0 . 0 0 % 	0 . 0 0 % 	0.0 0 % 	0 . 0 0 % 	1 . 0 0
ESIC Market	2 8. 5 7 %	7. 1 4 % 	0. 0 0 % 	0. 0 0 % 	5 7 . 1 4 %	7 . 1 4 % 	0.0 0 % 	4 2 . 8 6 %	1 . 9 3
Financial studies	0. 	1 	0. 	0. 	0 	0 	0.0 	0 	2

	0 0 %	0 0. 0 %	0 0 %	0 0 %	. 0 0 %	. 0 0 %	0 %	. 0 0 %	. 0 0
Studies on consumption	8 0. 0 0 %	0. 0 0 %	0. 0 0 %	0. 0 0 %	2 0 . 0 0 %	0 . 0 0 %	0.0 0 %	6 0 . 0 0 %	2 . 4 0
Harvard Deusto Business Review	0. 0 0 %	0. 0 0 %	3 3. 3 3 %	1 6. 6 7 %	1 6 . 6 7 %	0 . 0 0 %	33. 33 %	0 . 0 0 %	2 . 3 3
Harvard Deusto Finance and Accounting	0. 0 0 %	1 0 0. 0 %	0. 0 0 %	0. 0 0 %	0 . 0 0 %	0 . 0 0 %	0.0 0 %	5 0 . 0 0 %	2 . 0
Harvard Deusto Marketing and Sales	0. 0 0	0. 0 0	0. 0 0	0. 0 0	1 0 0	0 . 0 0	0.0 0 %	0 . 0 0	2 . 0

	%	%	%	%	.	0		0	0
					0	%		%	
					0				
					%				
Spanish	1	1	4	1	0	1	0.0	5	1
Commercial	4.	4.	2.	4.	.	4	0	7	.
Information	2	2	8	2	0	.	%	.	8
	9	9	6	9	0	2		1	6
	%	%	%	%	%	9		4	
						%		%	
Research and	1	0.	0.	2	6	1	0.0	9	1
Marketing	0.	0	0	0.	0	0	0	.	.
(AEDEMO)	0	0	0	0	.	.	%	0	6
	0	%	%	0	0	0		9	6
	%			%	0	0		%	
					%	%			
Economic Research	0.	0.	0.	0.	1	0	0.0	1	2
	0	0	0	0	0	.	0	0	.
	0	0	0	0	0	0	%	0	0
	%	%	%	%	.	0		.	0
					0	%		0	
					0			0	
					%			%	
European	1	0.	1	2	1	0	28.	1	2
Management and	4.	0	4.	8.	4	.	57	0	.
Business	2	0	2	5	.	0	%	0	5
Economics	9	%	9	7	2	0		.	7

Research _	%		%	%	9	%		0	
					%			0	
								%	
Spanish Economy	0.	0.	0.	1	0	0	0.0	0	1
Papers _	0	0	0	0	.	.	0	.	.
	0	0	0	0.	0	0	%	0	0
	%	%	%	0	0	0		0	0
				0	%	%		%	
				%					
Double Game	0.	7	0.	0.	0	0	28.	1	1
	0	1.	0	0	.	.	57	4	.
	0	4	0	0	0	0	%	.	2
	%	3	%	%	0	0		2	1
		%			%	%		9	
								%	
Accounting	0.	1	0.	0.	0	0	0.0	1	1
Magazine _	0	0	0	0	.	.	0	0	.
	0	0.	0	0	0	0	%	0	5
	%	0	%	%	0	0		.	0
		0			%	%		0	
		%						0	
								%	
Economics and	0.	0.	5	0.	0	5	0.0	5	3
Business Magazine	0	0	0.	0	.	0	0	0	.
_	0	0	0	0	0	.	%	.	0
	%	%	0	%	0	0		0	0
			%		%	0		0	

						%		%	
Spanish Journal of Agrosocial and Fisheries Studies	1 0 0. 0 0 %	0. 0 0 % 	0. 0 0 % 	0. 0 0 % 	0 . 0 0 % 	0 . 0 0 % 	0.0 0 % 	1 0 0 . 0 0 %	3 . 3 3
Spanish Magazine of Financing and Accounting	0. 0 0 % 	1 0 0. 0 0 %	0. 0 0 % 	0. 0 0 % 	0 . 0 0 % 	0 . 0 0 % 	0.0 0 % 	4 6 . 6 7 %	1 . 4 0
Spanish Journal of Marketing Research (ESIC)	1 0 0. 0 0 %	0. 0 0 % 	0. 0 0 % 	0. 0 0 % 	0 . 0 0 % 	0 . 0 0 % 	0.0 0 % 	1 0 0 . 0 0 %	3 . 5 0
European Journal of Management and Business Economics	0. 0 0 %	0. 0 0 %	3 7. 5 0 %	2 5. 0 0 %	2 5 . 0 0 0 %	0 . 0 0 %	12. 50 % 	3 7 . 5 0	2 . 1 3

					%			%	
Accounting	0.	9	0.	0.	0	0	8.3	8	1
Technique	0	1.	0	0	.	.	3	.	.
	0	6	0	0	0	0	%	3	5
	%	7	%	%	0	0		3	8
		%			%	%		%	

They have also been published, with slight modifications, in national magazines. It should be noted that the first publication did not occur until 1998 (Aragón, 1998) and that the rest of the publications appeared in the last three years of the period analyzed; 4 in 2001, 3 in 2002 and 6 in 2003. The explanation for this growing interest of national authors in publishing internationally can be found in the improvement of research training, the carrying out of research of a more international nature. and in the reform of the evaluation systems of research activity carried out in Spain in recent years.

One of the main differences with national publications is the greater empirical content of the works published internationally (71% are empirical in nature compared to 37.9% in national journals), which may be due to the demands editorials of the magazines considered. Furthermore, a greater tendency towards teamwork is observed, since 92.8% of the works are signed by several authors. 21.4% of the works are carried out by authors from different universities and 14.2% by authors of different nationalities. It is noteworthy that 50% of the analyzed works originate from the University of Oviedo.

The main research topic with 42.8% of the works is *Environmental Management (strategy and attitudes)*, followed by *Production/Operations*



(21.4%) , *Consumer Behavior* (14.2%) and *SGMA /Certification/Audit* (14.2%). An interesting fact is that there are no international publications on the two main topics identified at the national level :

« financial management and environmental accounting » and « green marketing ».

4. Conclusions

Throughout this work we have analyzed the development of research in Spain on environmental management in companies during the last decade, through the analysis of scientific publications that appeared in the main magazines published in Spain, as well as the works published by Spanish authors in the most prestigious international journals. As we pointed out in the introduction, our main objective has been to analyze the evolution and methodological characteristics of research on this subject, so that we can observe the path taken up to this point and describe the current situation of research on this subject. issue.

According to the results obtained in our work, we can point out the following conclusions:

- There is a growing trend in the number of publications on environmental management in the company during the period of analysis, mainly from 1999 onwards , which confirms, once again, the growing interest in academic and professional fields in the relationships between business and environment (Hoffman and Ehrenfeld, 1998; de Burgos and Céspedes,



2001). We think that this trend can to be maintained in the future, fundamentally due to the appearance and development in recent years of new lines of work, mainly in the topics of environmental management (strategy and attitudes) and EMS/certification/audit.

- This increase in the number of publications is accompanied by a significant increase in the number of works of a empirical, which provides greater solidity and scientific rigor to the research carried out. Surely, the incorporation of external evaluators in a good part of the journals analyzed has influenced this result, although we can also think that, in Spain, research on environmental management in companies is in a growth phase and that it is gradually going acquiring the nuances of maturity necessary to become a broad and fruitful field of research. This is also evident in the fact that in the last three years of the period analyzed, Spanish authors have begun to direct their research to international journals.
- Regarding the research topics used, we can point out that *financial management and environmental accounting* , *ecological marketing* , *(general) environmental management* and *consumer behavior* have been the most studied. Although in recent years publications on the company's strategies and attitudes towards environmental problems have been very relevant. At an international level, there is a notable increase in the number of publications during the last 3 years, fundamentally in the topic *Environmental management (strategies and attitudes)* , highlighting the work carried out at the University of Oviedo.
- In accordance with one of the characteristic features of research in Spain, publications on environmental management come mainly from the



academic world. However, this should not be understood as a lack of attention to the environmental management problems of Spanish companies, since of the total of empirical works, 72% use sources of primary information, mainly through conducting surveys of both national (49.2%) and regional and local (47.6%) levels. This would indicate that the research carried out has been developed in the company environment. sa Spanish, describing its behavior in the face of the environmental challenges that arise.

To conclude, we must once again emphasize that our first intention has been to provide researchers in this matter with a compendium of the existing literature, which facilitates their research work, as well as providing new knowledge to the field of company environmental management. This is an ambitious work, with many interactions between different fields of research, extensive ramifications of the problems, different possibilities of approaching them and multiple aspects to elucidate, which we will try to describe in future works.

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