

Environmental accounting and environmental costs: an analysis of the scientific production from 1996 to 2007

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Abstract

The purpose of this research is to analyze the scientific production on environmental accounting and environmental costs in the time period between 1996 and 2007. Environmental accounting and environmental costs were the keywords used for thematic classification. The following aspects were analyzed: type of study, searching strategy and academic affiliation of the authors. The results showed growth in the two themes – from three studies in 1996 to ten studies in 2007, in a total of 80 studies in that period. Overall, the environmental costs theme gained greater attention from researchers, representing 61%, against 39% from the studies that addressed the environmental accounting theme. It was observed that, of the 148 authors identified, 13 were responsible for 48.75% of the publication total. This research aimed to contribute to the demonstration of the 'state of the art' on environmental accounting and environmental costs, in the domestic and international contexts.

Keywords

Environmental accounting. Environmental costs. Scientific production.

1. Introduction

Accounting, as a science, has grown steadily and significantly in recent years due to the increase in the number of strictu sensu graduate programs in the theme and, consequently, in the scientific production. Environmental accounting is a branch of the accounting science (YAKHOU; DORWEILER, 2004) that has recently been attracting the interest of not only accounting professors and professionals, but also of business administrators, the press, politicians and the general public, who have been observing the environment and, for these reasons, social problems can be dealt with, at least partially, by means of the identification, measurement and evaluation of the interaction between companies and the environment (MATHEWS, 1997).

Accounting imposes an array of challenges of measurement informative order, recognition and

valuation of environmental nature that commune with the interests of the several segments aforementioned. In order to confirm this, it is necessary to count on accurate information about the environmental costs needed to elaborate reliable financial environmental indicators. Sánchez (2003) believes that the different methodologies of environmental accounting contribute to the construction of indicators and the valuation of companies' environmental costs.

Although environmental accounting appeared over 30 years ago (MATHEWS, 1997, 2000), it was only in the 1990's that the first publications came up in Brazil (CALIXTRO, 2005). The mapping of the academic studies published in the environmental costs and accounting area enables the better understanding of how academics and companies deal with these variables. Therefore, the purpose of this research is

to know and quantify the scientific production on environmental costs and environmental accounting in the time period between 1996 and 2007. The option for studying this specific period was based on the fact that Calixtro (2005) and Mathews (1997, 2000) had already carried out similar researches on these themes in earlier times.

Studies of this type, on scientific production, are common in several areas, such as human resources (TONELLI et al., 2003), marketing (VIEIRA, 2003), operational management (ARKADER, 2003) and social responsibility (MORETTI; FIGUEIREDO, 2007). In the accounting area, some studies should be remarked, like the ones by Riccio, Carastan and Sakata (1999); Cardoso, Pereira and Guerreiro (2004); Cardoso et al. (2005); Martins and Silva (2005); Mendonça Neto, Riccio and Sakata (2006); Beuren, Schindwein and Pasqual (2007), among others. However, the author could not find studies approaching the themes of environmental costs and/or environmental accounting, except the work by Calixtro (2005), who has analyzed the researches on environmental accounting in Brazil. The following studies stand out in the international context in the accounting area: Mathews (1997), Ferreira and Merchant (1992), Ji (2000), Degos and Mattessich (2006), among others.

Besides this introduction, the present article is organized in four topics. The next topic shows the theoretical framework on environmental costs and accounting. In the third topic of this article, the methodological procedures here used are presented. The fourth topic presents and discusses the main results obtained. The final considerations are reported in the end of the article.

2. Theoretical framework on environmental costs and accounting

2.1. *Environmental accounting*

One of the great contributions in the field of social and environmental accounting internationally was granted by Mathews (1997), who revised 25 years of the literature in the area. The author provides a structure that allows readers and researchers to organize in time and determine the trends, offering bibliographic details from the beginning and interest for the study of this area. The author classifies his study in three time periods: from 1971 to 1980, from 1981 to 1990 and from 1991 to 1995. The subheadings researched by Mathews (1997) were the following: experimental studies, normative demonstrations, philosophical discussions, the non-accounting literature, educational programs, textbooks, regulated structures and other revisions of the literature.

Mathews (1997) comments that the literature related to social and environmental accounting was underdeveloped in the 1970's. However, this situation began to change in the first half of the 1980's due to the increase and the quality in the social accounting area, but only in the second half of the decade interests drifted to environmental accounting. Mathews (1997) reports that, since 1980, there have been changes in the focus, resulting in a significant increase of specializations in the social and environmental accounting literature.

In the last period, from 1991 to 1995, it was possible to notice a progress in the environmental issues within the accounting area, including interests of both managers and accountants. This period was characterized by a nearly complete supremacy of environmental accounting over social accounting (MATHEWS, 1997).

In a second study, Mathews (2000), using the same methodology adopted in 1997, analyzed the social and environmental accounting literature in the time period between 1995 and 2000. Environmental accounting has kept the ascendancy over social accounting everywhere; nevertheless, the latter has been represented by the section of social auditing.

Calixtro (2005), inspired in Mathews (1997, 2000), analyzed the Brazilian publications that approached the environmental matter in the accounting literature from 1991 to 2004. The author sorted the study in topics such as: a) accounting and environment; b) the first proposals; c) measurement of spent assets and environmental revenues; and d) experimental research in environmental accounting.

Based on the verification of the analyzed works on environmental accounting, Calixtro (2005) concluded that the research on the theme in Brazil is hampered due to four main factors: i) companies that are engaged in potentially polluting activities disclose little information about environmental events; ii) the Brazilian legislation is not strict enough; iii) most companies have limited liability, what hinders the access to their accounting reports; and iv) large corporations already have environmental management, but environmental accounting does not take part in these events.

Calixtro (2005) believes that environmental accounting in Brazil will first occur through the awareness of all professionals in the area, and then it will focus on the dissemination in the business world.

2.2. *Environmental costs*

The term environmental cost is difficult to define – the literature does not bring a clear and objective definition of it. The first difficulty found

when working with environmental costs is the fact of being intangible. "Intangible costs are those with high level of difficulty to be quantified, although their existence can be clearly noticed." (CALLADO, 2008, p. 4).

Motta (1996) emphasizes that environmental costs are not generally captured in market relations due to the lack of definition of private property rights. Thus, the cost of degradation does not fall on those who degrade, but it falls on society as a whole and on the future generations. The author remarks that the use of the environment generates externalities that are environmental costs not recognized by the system of prices and, therefore, external to the cost and demand functions.

Shields, Beloff and Heller (2008) point out that environmental costs are a subgroup of companies' operational costs. For example, when substances are released in the air, water or soil, they should be considered as a social cost, that is, an externality. The authors exemplify some of these environmental externalities, such as the requirement of extra investments in formation or prevention equipment, and fines or fees resulting from the breach of environmental regulations. New costs arise when these environmental externalities become internal; they should be obtained through the cost accounting system, in a way correct enough to facilitate sound decision making, once most of the times they are underestimated and hidden in the general expenses (SHIELDS; BELOFF; HELLER, 2008).

Callado (2008) corroborates this statement that shows the existence of difficulties to quantify any environmental costs, because they demand a more detailed accounting. The author observes that, in most cases, these costs exist, but are embedded in the management costs of companies. Campos (1996) identified this difficulty when studying a company from the textile sector and verified that it allocated all the costs to its products, which did not allow for the determination of unnecessary and costly activities of the production process. In the case of the relation between production process and the environment, it is not possible to know which activities are responsible for the pollution.

Ribeiro (2006) reckons environmental costs as all those costs related directly or indirectly to environmental protection, such as: a) depreciation and depletion of environmental assets belonging to the company; b) input procurement for control, reduction or elimination of pollutants; c) treatment of product residues; d) disposal of pollutant residues; e) recovery or repairing of contaminated areas; and f) labor used in the activities of control, prevention or recovery of the environment.

2.3. *Studies on accounting and costs*

Riccio, Carastan and Sakata (1999) analyzed the distribution and characteristics of the academic texts, including dissertations and theses produced for four Brazilian graduate programs in accounting: from 1962 to 1999, in the following institutions: 'Pontifícia Universidade Católica de São Paulo' (PUC-SP), 'Universidade de São Paulo' (USP), 'Fundação Getúlio Vargas' (FGV) and 'Universidade Estadual do Rio de Janeiro' (UERJ). The research focused on the disposition in the amount of dissertations and theses, the research method used and the topics covered by the accounting area. The authors identified 386 studies distributed in 20 accounting themes. The management and financing accounting topics represented 21% and 18%, respectively, while social and environmental accounting meant only 2% of the studies total; this finding consolidates the research by Calixtro (2005), where it is remarked that the environmental matter only started to raise the interest of researchers as from 2000.

Cardoso et al. (2005) analyzed the distribution, methodological characteristics, evolution and themes of the scientific publications on accounting between 1990 and 2003 in the level "A" domestic journals according to the classification by CAPES. In this period, 2,037 studies were published – 60 of them were identified as accounting studies distributed in 11 areas. The following areas were identified: costs accounting, management accounting, capital markets accounting, public accounting, tax accounting, budgetary, intellectual capital, finance accounting, information systems, contemporary aspects and financial planning. No studies on environmental costs or environmental accounting were identified.

Martins and Silva (2005), on the other hand, analyzed the theoretical framework employed by the authors of texts approved and disclosed in the 3rd and 4th Controlling and Accounting Congresses at the University of Sao Paulo (USP), in 2003 and 2004. The average number of references per text was 17. In the concept of the authors, the bibliography of the articles reveals an extremely conservative and conventional stance, since researchers seldom consult journals, ignore publications of congress proceedings and only occasionally make reference to citations from electronic addresses.

Beuren, Schlindwein and Pasqual (2007) studied the research profile on controlling published in the proceedings of the Meeting of the National Association of Graduate Studies and Research in Administration – EnANPAD and in the Controlling and Accounting Congresses at the University of Sao Paulo (USP) between 2001 and 2006. The authors

investigated the themes approached, the research methods adopted, the controlling approaches studied, the researchers' affiliation and the bibliography consulted and referenced in the papers. The research data revealed a gradual increase in the topic 'controlling' in the events researched during this period. However, the authors reported that they expected that the words 'controlling', 'controller', 'management accounting' and 'management control' would appear more often in the papers from both events, once they refer to an important theme in accounting.

On the international scene, Ferreira and Merchant (1992) conducted a survey in the field of accounting and management control in the time period between 1984 and 1992. The study was based on the review of 11 accounting research journals, two series of theses and a collection of papers presented in three research conferences in accounting responsibility from Harvard Business School and in publications in books. In this period, 82 studies were identified: 34 (41%) were published in the collections from Harvard Business School, 20 (24%) in the *Accounting, Organizations & Society* and the remaining (35%) were distributed among the nine research sources analyzed. Then, an evaluation was performed on the researchers' choice by topic, methods and presentation style and data interpretation. The most commonly demonstrated topics in the field of accounting and management control were costs, risks and return on investment potential.

In 1979, China reopened its market to the world and deployed a series of economic reforms. Since then, the economic growth of the country and the total proportion of the world trade have increased significantly. The accounting system has also been changed in order to fulfill the necessities of the economic reform and the world trade (Ji, 2000). Ji (2000) revised the studies published in English from 1966 to 1998 and investigated the different interpretations of the Chinese accounting by researchers, both Chinese as well as foreigners. The author also evaluated the importance of these studies for the development of international accounting and concluded that the development of accounting in China would be more closed to international practices and that the changes would be fundamental and dramatic.

In this research, Ji (2000) identified 91 studies distributed in 14 themes and separated them in three periods: 1966-1977, 1978-1992 and 1992-1998. In the first period, the author found only two studies; in the second period, 38; and in the third, 51 studies on accounting. In the second period, 1978-1992, the theme of finance accounting and reports predominated with 21%, followed by the management accounting

theme with 15% of the studies. In the third period, 1992-1998, the themes of accounting standardization and finance accounting and reports represented, respectively, 24 and 13% of the studies total. This findings show a shift in the focus. It is noteworthy that none of the 91 studies identified as accounting addressed the environmental matter.

Degos and Mattessich (2006) conducted a survey on the accounting publications in the French specialized literature between 1950 and 2000. The authors identified that different aspects of accounting research were examined in this period, such as the academic, social, matrix, events and history areas. Degos and Mattessich (2006) believe that the most important accounting subarea in France in that period was the Chart of Accounts together with its revisers, particularly with European countries in their legislative processes of standardization and harmonization. In the perspective of the authors, in the second half of the 20th century, the French influence on the accounting theory decreased partially because of the rise of the English accounting literature and the excessive focus on standardization; consequently, the academic research was neglected.

In the costs area, Cardoso, Pereira and Guerreiro (2004) traced the profile of research in the proceedings of the EnANPAD between 1998 and 2003. The authors researched the themes approached, the research methods adopted, the costs area segments studied, the researchers' academic affiliation and the type of bibliography consulted. Thirty-two studies related to costs were listed, distributed in 12 topics: 50% dealt with cost based on activities (ABC) in their applications, 12% were related to costing system and 3.1% approached the theme of environmental quality, characterizing, though, a reduced amount of studies on the environmental issue.

Callado and Almeida (2005) analyzed the profile of the articles on costs in the agribusiness published in the proceedings of the Brazilian Congress of Costs from 1994 to 2003. The authors identified 58 articles and assessed the following variables: theme area of the papers presented, publication by institution, region, researcher, methods used in the study, researches by economic segment and bibliographic classification. The theme areas identified were the following: measurement and costs management models in the primary sector, 53.45%; costs strategic management, 8.62%; costs and decision making, 6.90%; others, 17.24% and, respectively, costs for global competitiveness; case studies applied to the costs area; costs management and information systems; costing system, 3.45%.

Regarding the methods of the studies, the bibliographic research represented 55%, while the

field research meant 33% and the case studies were responsible for 7%. The papers by economic segments were as follows: zootechnical explorations (poultry and swine), plant extraction and animal exploitation, agriculture, processing of agricultural products and livestock, livestock farming, among others. Concerning the bibliographic classification, domestic books prevailed with 48.54%, while international book added up to 8.90%.

Schultz et al. (2006) evaluated the researches in the costs area in the services sector published in the proceedings of the EnANPAD and in the Qualis A and B administration and tourism journals between 2000 and 2004. In the proceedings of the EnANPAD, the authors found 2,737 articles, where nine of them dealt with costs in the services sector. Regarding the journals, in a total of twelve, the authors found 1,380 articles – three of them approached costs in the services sector.

Therefore, it is possible to verify that the environmental question is still way behind in both the study of environmental accounting as well as in the study of environmental costs, requiring greater attention not only from the part of the academics, but also from the part of companies, once it is a variable that can provide them sustainable competitive advantage.

The next section presents the methodological procedures that have guided the present research.

3. Research methodology

This descriptive quantitative research was carried out with the purpose of mapping the academic works published on the environmental accounting and environmental costs areas and, fundamentally, describing the type of study (theoretical dissertation, creation of a model or descriptive study) and the type of strategy (case study or non-identified). It is worth noting that Godoi and Balsini (2004) classify the *type of research* as qualitative, quantitative, quali-quantitative or theoretical dissertation; and the *strategy of research* as case study, multi-cases, documental, ethnographic or action and participative research. For the classification of researches oriented by the case study typology, Godoi and Balsini (2004) classify them as descriptive, exploratory or explanatory.

Keywords such as *environmental accounting* and *environmental costs* were used to identify articles related to environmental accounting and costs. The articles whose titles presented the words *environmental costs* were classified as “studies related to environmental costs” and those whose titles presented the words *environmental accounting* were classified as “studies related to environmental accounting”.

Then, a documental research that analyzed the domestic and international scientific production addressing the themes of environmental accounting and costs was structured.

The sample was probabilistic (randomized) and it comprised 80 studies distributed in 32 publication sources from proceedings, journals and graduate programs (Table 1). The sources researched were the journals ‘RAE – Revista de Administração de Empresas’ (Business Administration Journal); ‘RAC – Revista de Administração Contemporânea’ (Contemporary Administration Journal); ‘RAUSP – Revista de Administração USP’ (Administration Journal from the University of Sao Paulo); ‘RBE – Revista Brasileira de Economia’ (Brazilian Journal of Economy); ‘PPE – Pesquisa e Planejamento Econômico’ (Economic Research and Planning); ‘RAP – Revista de Administração Pública’ (Public Administration Journal); ‘READ – Revista Eletrônica de Administração’ (Administration Electronic Journal); ‘RBC – Revista Brasileira de Contabilidade’ (Brazilian Journal of Accounting); ‘RCF – Revista Contabilidade & Finanças (USP)’ (Finance & Accounting Journal of the University of Sao Paulo), ‘Revista do BNDES’ (Journal of the National Bank for Economic and Social Development); ‘Revista Pensar Contábil’ (“Pensar Contabil” Magazine); ‘Revista Universo Contábil’ (“Universo Contabil” Magazine) and ‘SciELO’ – (Scientific Electronic Library Online).

Other sources of dissemination were the proceedings from the following congresses and meetings: ‘EnANPAD – Encontro Nacional de Pós-graduação e Pesquisa em Administração’ (Meeting of the National Association of Graduate Studies and Research in Administration); ‘ENEGEP – Encontro Nacional de Engenharia de Produção’ (Production Engineering National Meeting); ‘ENGEMA – Encontro Nacional sobre Gestão Empresarial e Meio Ambiente’ (Business and Environment Management National Meeting); and ‘CBC – Congresso Brasileiro de Custos’ (Brazilian Congress of Costs). Besides these sources the following digital libraries were researched: ‘UFSC – Universidade Federal de Santa Catarina’; ‘USP – Universidade de São Paulo’; ‘UFRJ – Universidade Federal do Rio de Janeiro’; ‘UFRGS – Universidade Federal do Rio Grande do Sul’; ‘Unicamp – Universidade de Campinas’; ‘UNB – Universidade de Brasília’; Theses database from ‘CAPES’; ‘SciELO – Scientific Electronic Library Online’; ‘Google Academic’ and Database from ‘Proquest’.

The journals and proceedings were selected for research in function of their relation to the theme studied and because they addressed topics connected to administration, accounting, economy and engineering.

Table 1. Publication sources and amount of studies published in the environmental accounting and costs areas in the time period between 1996 and 2007.

| Sources | Years | | | | | | | | | | | | Total |
|-----------------------------------|-------|------|------|------|------|------|------|------|------|------|------|------|-------|
| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | |
| Dissertation - UFSC | 1 | | | | | | | | 1 | | | | 2 |
| Dissertation - Unicamp | | 1 | | | | | | | | | | | 1 |
| RAE | | 1 | | | | | | | | | | | 1 |
| ENEGET | 1 | 1 | | | | | | | 2 | 1 | | 1 | 5 |
| Brazilian Congress of Costs | | | 1 | 3 | 2 | 3 | 6 | 2 | 4 | 6 | 1 | 3 | 31 |
| Thesis - Univ. UTAH - EUA | | | 1 | | | | | | | | | | 1 |
| International Congress of Costs | | | | 1 | | | | | | | | | 1 |
| BNDES Journal | | | | 1 | | | | | | | | | 1 |
| Thesis - Univ. of N. York | | | | 1 | | | | | | | | | 1 |
| "Pensar Contábil" Magazine | | | | | 2 | | | | | | | | 2 |
| RBC | | | | | 1 | | 1 | | | 1 | | | 3 |
| F.C.E. - Yearbook | | | | | | 1 | | | | | | | 1 |
| Aud. & Ac Journal | | | | | | 1 | | | | | | | 1 |
| EnANPAD | 1 | | | | | 1 | | 1 | 1 | | | | 4 |
| Dissertation - USP | | | | | | 1 | | 1 | | | | | 2 |
| Dissertation - UFRJ | | | | | | 1 | | | | | | | 1 |
| Accounting % Finance Journal | | | | | | 1 | 1 | | 1 | | | | 3 |
| Accounting Conv. - RS | | | | | | | | 1 | | | | | 1 |
| Dissertation Nova Scotia - Canada | | | | | | | | 1 | | | | | 1 |
| Scientia et Technica | | | | | | | | 1 | | | | | 1 |
| Act. Contable Faces | | | | | | | | | 1 | | | | 1 |
| B. S. and the Environm. | | | | | | | | | 1 | | | | 1 |
| Univ. of Maryland - USA | | | | | | | | | | 1 | | | 1 |
| Business Science | | | | | | | | | | 1 | | | 1 |
| "Univ. Contábil" M. | | | | | | | | | | 2 | | 1 | 3 |
| J. of Business Ethics | | | | | | | | | | | 1 | | 1 |
| J. of Cleaner Prod. | | | | | | | | | | | 1 | | 1 |
| S. Accounting in Maringá | | | | | | | | | | | 1 | | 1 |
| Chil. de Ingeniería | | | | | | | | | | | | 2 | 2 |
| Costs & @gronég. on line | | | | | | | | | | | | 1 | 1 |
| Economic perspective | | | | | | | | | | | | 1 | 1 |
| Rev. Inst. Int. de Costos | | | | | | | | | | | | 1 | 1 |
| Total | 3 | 3 | 2 | 6 | 5 | 9 | 8 | 7 | 11 | 12 | 4 | 10 | 80 |

Source: research data.

The digital libraries and other sources were chosen at random.

The analysis procedure of the sources was inspired in Capon, Farley and Hoening (1990), who, through meta-analysis, found 320 studies in the finance area. The studies found by Capon, Farley and Hoening (1990) appeared in 65 journals, 19 books, 17 dissertations, five working papers and in two management academic proceedings.

In a second phase, abstracts were analyzed in order to identify the type of study and strategy used in the researches. The analysis was limited to these two models because it is not always possible to identify other methods of data collection only through the reading of abstracts. When the same study was published in proceedings and journals, when they were identified, only the ones published in journals were reckoned.

The authors' affiliation was considered by the authors' ties mentioned at the moment of the publication. When this information was not available, the Lattes platform was used.

Tables and figures were generated as from the information taken from the publication sources; these results and information will be discussed and interpreted in the next topic.

4. Research results

Initially, Table 1 shows the publication sources, the amount of studies per year and the total number of publications found in the research.

From the data in Table 1, it is possible to infer that the environmental accounting and costs themes began to gain greater attention of researches in the

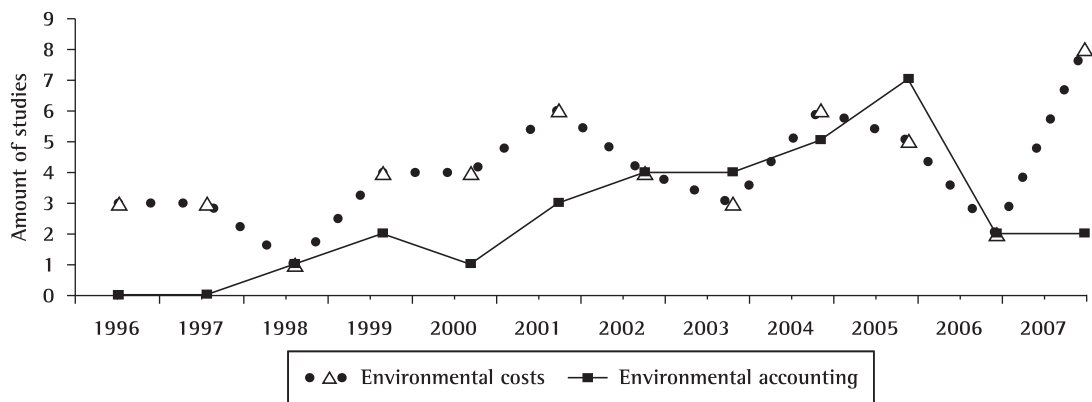


Figure 1. Studies carried out by theme area. Source: research data.

end of the 20th century and continued to grow into the 21st century, with some oscillations though (Figure 1), suffering a sudden fall in 2006 and resuming growth in 2007. This fall had the influence of the proceedings from the Brazilian Congress of Costs that in that year (2006) produced only one publication in the area, since it represented almost 40% of the publication total of all the other means of communication in the researched period: 1996-2007.

This result corroborates Calixtro (2005), who emphasizes that an evolution in the production of studies on the environmental matter began only in 2000. It also confirms the study by Riccio, Carastan and Sakata (1999) that showed that, out of the 20 accounting topics, the environmental accounting and costs themes represented only 2% of the studies. There is another interesting datum: of the 80 studies realized, 32 were distributed to means of communication, an average of 2.43 articles per publication source.

Observing all the reports related to the EnANPAD (the biggest event of the administration scientific and academic community in the country), only a small amount of studies addressing the environmental accounting and costs themes is noticed. This is emphasized in the work by Cardoso, Pereira and Guerreiro (2004). These authors carried out a research based on the management control and accounting papers published by EnANPAD, from 1998 to 2003, and observed that, out of the 32 articles distributed in 12 themes, only one study on the mentioned theme was found (ROBLES JUNIOR; BONELLI, 2001), therefore, characterizing it as a still incipient theme.

Such finding was also verified in the study by Callado and Almeida (2005), who analyzed the articles profile on the agribusiness and identified the following theme areas: measurement and costs management models in the primary sector, costs

Tabela 2. Distribution of topics of national and international studies.

| | Thematic studies | | Total |
|--------------------------|------------------|----------|-------|
| | International | National | |
| Environmental cost | 29 | 68 | 61 |
| Environmental accounting | 71 | 32 | 39 |

Source: research data.

strategic management, costs and decision-making, costs for global competitiveness, costs management and information and costing systems. It is possible to observe that the term “environmental costs” does not appear in any of the costs themes researched in the agribusiness segment.

Figure 1 shows an evolution of the studies by theme area carried out between 1996 and 2007.

It is possible to observe that the two themes have evolved, but not constantly, since both suffered a reduction in 2000, 2003 and 2006. The studies addressing environmental costs in 2007 experienced the greatest growth in the whole period (eight studies). On the other hand, the environmental accounting theme has remained stable between 2006 and 2007, when only two studies addressing the subject were found.

Table 2 shows that, in general, the environmental costs theme has gained more attention from the part of researchers, representing 61%, while 39% of the studies have addressed environmental accounting. The table also shows that, when separated by domestic and international studies, there is a high amount of international studies on the environmental accounting theme, representing 71 against 29% of those that addressed environmental costs. On the other hand, it is possible to observe that the percentage is inverted in Brazil, once the studies on environmental costs represented 68 against 32% on environmental accounting, characterizing a difference on the focus.

It is not possible to generalize such affirmation due to the reduced amount of international studies available, though. This reduction occurred due to the lack of some international bases such as the Proquest, since CAPES did not renew its contract with the ABI Inform Global for the 2008 term (HAEFFNER, 2008), becoming limited to the theses and dissertations.

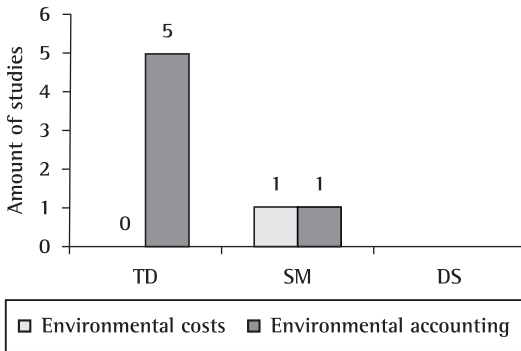


Figure 2. Types of international studies. TD: Theoretical Dissertation; SM: Suggested Model; DS: Descriptive Studies. Source: research data.

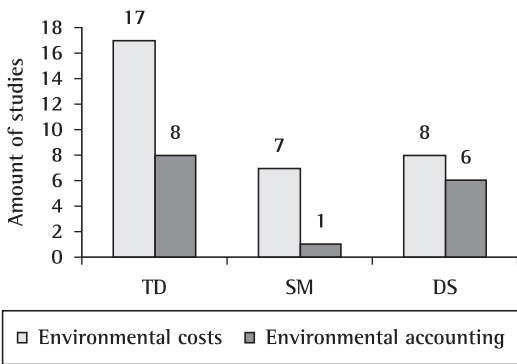


Figure 3. Types of domestic studies. Source: research data.

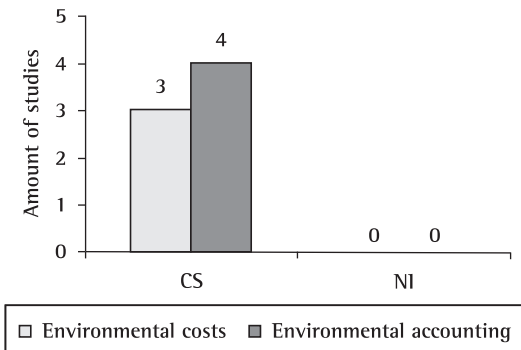


Figure 4. International study strategies. CS: Case study; NI: non-identified. Source: research data.

Figures 2 and 3 show the types of studies identified in the research. Figure 2 (types of international studies) reveals that the theoretical dissertations on environmental accounting have prevailed, since no study addressing the environmental costs theme was identified. For the models suggested for identification, measurement and accounting of environmental costs, only one for each analyzed theme was found, that is, one model in environmental accounting and one in environmental costs. Regarding the descriptive studies, neither theme was found in the types of international studies.

Unlike the international studies, it is possible to observe, in Figure 3, an inversion concerning the themes, because, in the types of domestic studies, the theoretical dissertations addressing environmental costs are the majority or almost the double compared to the ones addressing environmental accounting. The same trend is observed, in the types of domestic studies, both in the models suggested for measurement and accounting of environmental costs and in the descriptive studies.

Figures 4 and 5 show the study strategies identified in the works.

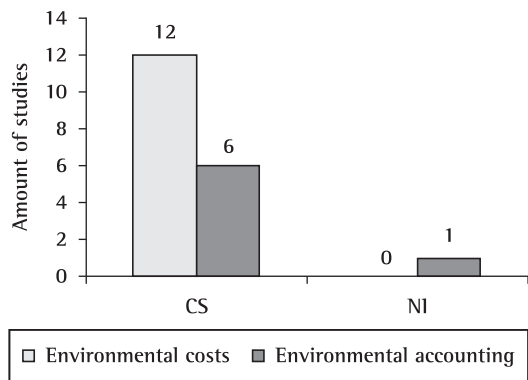


Figure 5. Domestic study strategies. Source: research data.

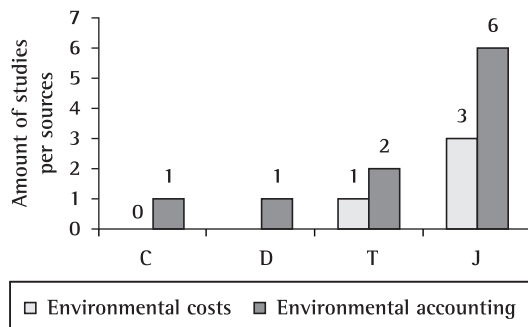


Figure 6. Sources of international publications. C: Congresses; D: Dissertations; T: Theses; P: Journals. Source: research data.

The same trend of the types of studies can be seen in the research strategies used. Figure 4 shows that the study case research strategy prevailed for the environmental accounting theme internationally, while in Brazil (Figure 5), the attention of researches was more focused on the environmental costs theme, that is, the double if compared to environmental accounting.

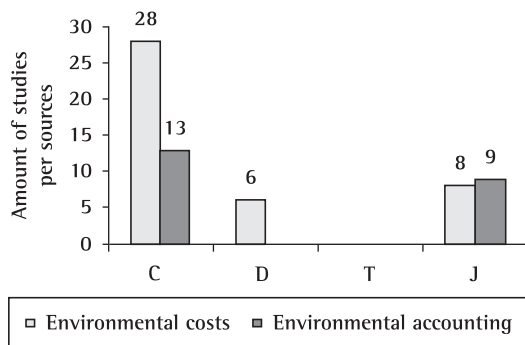


Figure 7. Sources of domestic publications. Source: research data.

Table 3. Number of authors per article.

| Number of authors | Articles | Percentage (%) |
|-------------------|----------|----------------|
| 1 | 35 | 43.75 |
| 2 | 24 | 30.00 |
| 3 | 9 | 11.25 |
| 4 | 6 | 7.50 |
| 5 | 4 | 5.00 |
| 6 | 1 | 1.25 |
| No authors | 1 | 1.25 |
| Total | 80 | 100 |

Source: research data.

Regarding the sources of international publications (Figure 6), the journals have maintained the head for both the environmental costs and the environmental accounting themes.

Figure 7 (sources of domestic publications) shows that the congresses have led the ranking for publications in both themes; in the dissertations, there were studies only in the environmental costs theme; in the theses, no studies have been found; and in journals, the environmental accounting theme has led the amount of publications.

Table 3 shows that, unlike the study by Cardoso, Pereira and Guerreiro (2004), who analyzed the articles from the EnANPAD and identified 21.88% of the articles written by just one author and 53.13% by two authors, in the present research this profile has changed to 43.75% of the works by just one author and 30% of them realized by two authors.

This change in profile may have been influenced by the theses and dissertations, once they present only one author, while both in articles from events as well as from journals, the name of the advisor is generally also included. Another characteristic was the greater dispersion between the present study and the one by Cardoso, Pereira and Guerreiro (2004), since they identified a maximum number of four authors by article, while this research identified studies with up to six authors.

Table 4 presents a panoramic view of the publications concentration.

Table 4 shows that almost 50% of the publications are concentrated in 13 authors and two of them are foreigners (from Portugal and Chile). Of all authors,

Table 4. Amount of articles published according to the professional ties of the authors.

| Authors | Institution | Costs | Accounting | Total | % |
|--|--------------------|-------|------------|-------|-------|
| RIBEIRO, Maisa de S. | FEA-RP/USP | 3 | 1 | 4 | 5.00 |
| EUGÊNIO, Teresa C. P. | ISCAL - Portugal | | 4 | 4 | 5.00 |
| CAMPOS, Lucila M. de S. | UFSC e UNIVALI | 4 | | 4 | 5.00 |
| KLIEMANN NETO, Francisco J. | UFRGS | 4 | | 4 | 5.00 |
| KRAEMER, Maria E. P. | UNIVALI | 1 | 2 | 3 | 3.75 |
| DAVID, Afonso R. de | F. Santo André | 1 | 2 | 3 | 3.75 |
| CALIXTRO, Laura | UFMG | | 3 | 3 | 3.75 |
| BEN, Fernando | UCS | 3 | | 3 | 3.75 |
| SELIG, Paulo M. | UFSC | 3 | | 3 | 3.75 |
| FERREIRA, Aracéli C. de S. | UFRJ | 1 | 1 | 2 | 2.50 |
| DURÁN, Orlando | Valparaiso - Chile | 2 | | 2 | 2.50 |
| BORBA, José A. | CPGA/UFSC | | 2 | 2 | 2.50 |
| POSSAMAI, Osmar | UFSC | 2 | | 2 | 2.50 |
| Total of articles | | 24 | 15 | 39 | 48.75 |
| General total of articles | | 49 | 31 | 80 | 100 |
| Authors with more than one published article | | | | 13 | 8.78 |
| Authors with only one published article | | | | 135 | 91.22 |
| Total of authors | | | | 148 | 100 |

Source: research data.

only 8.78% have published more than one study and 91.22% have published just one study addressing the matter of environmental accounting and/or costs, characterizes the existence of quite few authors disseminating this area. Ribeiro, Eugênio, Campos and Kliemann Neto are the featured authors with four publications each.

5. Final considerations

The purpose of this study was to contribute to a better understanding of the current scenario of the academic production on the environmental accounting and costs themes. This research has demonstrated that, despite of some oscillations, the studies addressing this theme have grown, once that, in 1996, only three studies were found on environmental costs and there were no studies about environmental accounting; while in 2007, there were already 49 studies approaching costs and 31 addressing the environmental accounting theme, with a general total of 80 researches. An interesting fact to be reported is that, in Brazil, the environmental costs theme has gained the interest of researchers with a representation of 68 against 32% of studies that addressed environmental accounting. In the international scene, there is an inversion of the focus, since the environmental accounting theme represented 71% of the studies total against 29% that addressed environmental costs.

The theoretical dissertations on environmental accounting prevailed in the international context, considering that in Brazil there was more emphasis on environmental costs. Nationally, the models proposed for the identification and measurement of environmental costs were seven times greater than the models proposed for the accounting of the environmental costs. In the international context, there was one model proposed for the accounting theme and one for environmental costs.

The case studies were also greater in environmental accounting in the international scene, while, in Brazil, they were mostly applied for the evaluation of environmental costs. Regarding the publication sources in Brazil, the studies were disseminated in greater amount in the proceedings of congresses, while internationally they were published mostly in journals.

It is also possible to observe that 8.78% of all authors have published more than one study on the theme; the other 91.22% had just one publication in the area, which denotes a lack of continuity on the subject. Another finding was that 43.75% of the publications were produced by only one author, which indicates a lack of study groups approaching the theme.

The fact that this article has adopted a probabilistic sampling, with several sources of publications and only the reading of the abstracts, may have led to the omission of a few studies and/or to the incorrect identification of research strategies. Thus, its evidence and findings cannot be generalized; nevertheless, they should be understood as tendencies and indications of the evolution and concern with the theme researched.

Therefore, the results here presented have contributed to characterize the profile of the articles published on the environmental accounting and costs themes and to emphasize their more frequent features. It was possible to notice that there has been a significant increase in the studies addressing the themes of environmental accounting and environmental costs; however, new and more comprehensive studies are suggested, such as surveys, in order to identify more precisely which contributions these works may give to the improvement of the environment.

References

- ARKADER, R. A pesquisa científica em gerência de operações no Brasil. *Revista de Administração de Empresas*, v. 43, n. 1, p. 70-80, 2003.
- BEUREN, I. M.; SCHLINDWEIN, A. C.; PASQUAL, D. L. Abordagem da controladoria em trabalhos publicados no EnANPAD e no Congresso USP de Controladoria e Contabilidade de 2001 a 2006. *Revista Contabilidade & Finanças da Universidade de São Paulo*, v. 18, n. 45, p. 22-37, 2007.
- CALIXTRO, L. Análise da pesquisa sobre contabilidade ambiental no Brasil. *Revista Brasileira de Contabilidade*, n. 154, p. 23-35, 2005.
- CALLADO, A. L. C. *A Importância da Gestão dos Custos Ambientais*. Universo Ambiental. Disponível em: <http://www.universoambiental.com.br/novo/artigos_ler.php?canal=4&canallocal=4&canalsub2=10&id=224&pagina=1>. Acesso em: 23 abr. 2008.
- CALLADO, A. L. C.; ALMEIDA, M. A. Perfil dos artigos sobre custos no agronegócio publicados nos anais do Congresso Brasileiro de Custos. *Custos e @gronegócio on line*, v. 1, n. 1, p. 42-61, 2005.
- CAMPOS, L. M. S. *Um estudo para definição e identificação dos custos da qualidade ambiental*. 1996. 165 f. Dissertação (Mestrado em Engenharia de Produção)-Universidade Federal de Santa Catarina, Florianópolis, 1996.
- CAPON, N.; FARLEY, J. U.; HOENIG, S. Determinants of financial performance: a meta-analysis. *Management Science*, v. 36, n. 10, p. 1143-1159, 1990. <http://dx.doi.org/10.1287/mnsc.36.10.1143>
- CARDOSO, R. L.; PEREIRA, C. A.; GUERREIRO, R. A produção acadêmica em custos no âmbito do EnANPAD: uma análise de 1998 a 2003. In: ENCONTRO ANUAL DA ANPAD, 28., 2004, Curitiba. *Anais... Curitiba: ANPAD*, 2004.
- CARDOSO, R. L. et al. Pesquisa científica em contabilidade entre 1990 e 2003. *Revista de Administração de Empresas*, v. 45, n. 2, p. 34-45, 2005.

- DEGOS, J.-G.; MATTESSICH, R. Accounting research in the French language area - second half of the 20th century. *Review of Accounting and Finance*, v. 5, n. 4, p. 423-442, 2006. <http://dx.doi.org/10.1108/14757700610712471>
- FERREIRA, L. D.; MERCHANT, K. A. Field research in management accounting and control: a review and evaluation. *Accounting Auditing & Accountability Journal*, v. 5, n. 4, p. 3-34, 1992. <http://dx.doi.org/10.1108/09513579210019503>
- GODOI, C. K.; BALSINI, C. P. V. A Metodologia Qualitativa nos Estudos Organizacionais: análise da produção científica entre 1997 e 2003. In: ENCONTRO DE ESTUDOS ORGANIZACIONAIS - ENEO, 3., 2004, Atibaia. *Anais...* Atibaia: ANPAD, 2004.
- HAEFFNER, C. *Acesso livre* . [mensagem pessoal]. Mensagem recebida por <crisnah@capes.gov.br> em nome de cac <cac@capes.gov.br> em 06 mar. 2008.
- JI, X-D. Evaluation of research on chinese accounting. *Managerial Finance*, v. 26, n. 5, p. 41-62, 2000. <http://dx.doi.org/10.1108/03074350010766675>
- MARTINS, G. A.; DA SILVA, R. B. C. Plataforma teórica - trabalhos do 3º e 4º congressos USP de Controladoria e Contabilidade: Um estudo bibliométrico. In: CONGRESSO USP DE CONTROLADORIA E CONTABILIDADE, 5., São Paulo. *Anais...* São Paulo: FEA/USP, 2005.
- MATHEWS, M. R. Twenty-five years of social and environmental accounting research. Is there a silver jubilee to celebrate? *Accounting, Auditing & Accountability Journal*, v. 10, n. 4, p. 481-531, 1997. <http://dx.doi.org/10.1108/EUM000000004417>
- MATHEWS, M. R. *The development of social and environmental accounting research 1995-2000*. Disponível em: <www-accountancy.massey.ac.nz/docs/Discussion%20Paper/205.pdf>. Acesso em: 02 abr. 2008.
- MENDONÇA NETO, O. R.; RICCIO, E. L.; SAKATA, M. G. Paradigmas de pesquisa em contabilidade no Brasil: ENANPAD: 1981-2005. In: ENCONTRO ANUAL DA ANPAD, 30., 2006, Salvador. *Anais...* Salvador: ANPAD, 2006.
- MORETTI, S. L. A.; FIGUEIREDO, J. C. B. Análise bibliométrica da produção sobre responsabilidade social das empresas no EnANPAD: evidências de um discurso monológico. In: ENCONTRO ANUAL DA ANPAD, 31., 2007, Rio de Janeiro. *Anais...* Rio de Janeiro: ANPAD, 2007.
- MOTTA, R. S. *Indicadores ambientais no Brasil: aspectos ecológicos, de eficiência e distributivos*. Rio de Janeiro: IPEA, 2006. Disponível em: <http://www.ipea.gov.br/pub/td/1996/td_0403.pdf>. Acesso em: 24 abr. 2008.
- RIBEIRO, M. S. *Contabilidade ambiental*. São Paulo: Saraiva, 2006.
- RICCIO, E. L.; CARASTAN, J. T.; SAKATA, M. G. Accounting research at brazilian universities - 1962 - 1999. In: ASIAN-PACIFIC CONFERENCE, 11., 1999, Melbourne, Austrália. *Proceedings...* Melbourne, 1999.
- ROBLES JUNIOR, A.; BONELLI, V. V. Apuração dos Custos da Qualidade e dos Custos Ambientais Através da Contabilidade Baseada em Atividades. In: ENCONTRO ANUAL DA ANPAD, 25., 2001, Campinas. *Anais...* Campinas: ANPAD, 2001.
- SÁNCHEZ; J. J. C. Algunas consideraciones de los costos medioambientales en los procesos productivos. *Scientia Et Technica*, n. 21, 2003.
- SCHULTZ, C. A. et al. *Produção científica na área de custos no setor de serviços no período de 2000 a 2004*. Disponível em: <<http://www.congressoeac.locaweb.com.br/artigos62006/499.pdf>>. Acesso em: 25 abr. 2008.
- SHIELDS, D.; BELOFF, B.; HELLER, M. *Environmental cost accounting for chemical & oil companies: a benchmarking study*. Disponível em: <<http://permanent.access.gpo.gov/lps6491/bench.pdf>> Acesso em: 25 abr. 2008.
- TONELLI, M. J. et al. Produção acadêmica em recursos humanos no Brasil: 1991-2000. *Revista de Administração de Empresas*, v. 43, n. 1, 2003.
- VIEIRA, F. G. D. Narciso sem espelho: a publicação brasileira de marketing. *Revista de Administração de Empresas*, v. 43, n. 1, 2003.
- YAKHOU, M.; DORWEILER, V. P. Environmental accounting: an essential component of business strategy. *Business Strategy and the Environment*, v. 13, n. 2, p. 65, 2004. <http://dx.doi.org/10.1002/bse.395>