

## **ENVIRONMENTAL CONSERVATION ACTIONS INFLUENCING INDUSTRIAL COMPETITIVENESS AND INNOVATION: THEORETICAL-PRACTICAL FINDINGS**

*Ações de Conservação Industrial influenciando a Competitividade e a Inovação Industrial:  
Conclusões Teórico-práticas.*

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**Abstract:** The aim of this study was to understand if environmental conservation actions influence industrial competitiveness and innovation. A systematic review was performed in the Scopus® database searching for studies published between 2009 and 2016, in order to obtain the knowledge base related to the topic. Additionally, a questionnaire grounded on literature was applied to multi-sector group of 15 medium and large Brazilian companies with ISO-14000 certification. The results showed that in practice companies recognize that industrial environmental conservation actions have influence on competitiveness and innovation when companies adopt a conscious selection of materials for development of new products without environmental risks or impacts, as well as through continued improvements, innovation of company management system, processing innovations to meet environmental requirements allowing increasing their operational efficiency, processing innovations meeting environmental requirements allowing increasing its productivity, revenue generation with recyclables or wastes, and non-generation of exporting barriers, resulting in costs and losses reduction, thereby increasing the company image in market, thus practical results supported the theoretical basis grounded by Porter.

**Keywords:** Industrial and Environmental Management; Competitiveness; Innovation; Industrial Ecology; Sustainable Development.

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**Resumo:** O objetivo deste estudo foi entender se as ações de conservação ambiental influenciam a competitividade e a inovação industrial. Uma revisão sistemática foi realizada no banco de dados Scopus® pesquisando estudos publicados entre 2009 e 2016, para obter a base de conhecimento relacionada ao tema. Além disso, um questionário baseado em literatura foi aplicado ao grupo multisectorial de 15 empresas brasileiras de médio e grande porte com certificação ISO-14000. Os resultados mostraram que na prática as empresas reconhecem que as ações industriais de conservação ambiental têm influência na competitividade e na inovação quando as empresas adotam uma seleção consciente de materiais para o desenvolvimento de novos produtos sem riscos ou impactos ambientais, bem como através de melhorias contínuas, inovação do sistema de gerenciamento de empresas, processando inovações para atender aos requisitos ambientais, permitindo aumentar sua eficiência operacional, processando inovações que atendem aos requisitos ambientais, permitindo aumentar sua produtividade, geração de receita com materiais recicláveis ou resíduos e barreiras de exportação não geradoras, resultando em redução de custos e perdas, aumentando assim a imagem da empresa no mercado, os resultados práticos apoiam a base teórica fundamentada por Porter.

**Palavras-chave:** Gestão Industrial e Ambiental; Competitividade; Inovação; Ecologia Industrial; Desenvolvimento sustentável.

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## INTRODUCTION

On the one hand, growing levels of global industrialization have benefited society in terms of both financial and social development. On the other hand, this growth has triggered serious concerns due to the environmental losses caused by industries and the secondary sector as a whole (transformation). Consequently, efforts have been made by several agents of society to mitigate expansion of the observed environmental damages.

In recent decades, the adoption of environmental conservation actions by companies has been encouraged and regulated by governmental and nongovernmental agents. Furthermore, corporate environmental conservation actions are now considered a key to helping promoting sustainable development.

The degradation of environmental resources has occurred mainly in the following ways: (i) consumption of natural resources, such as uncontrolled devastation of forests and unconscious use of water; (ii) the emission of pollutant and toxic gases that are harmful to the atmosphere and to living beings, and (iii) the inadequate disposal of solid wastes and effluents (Andrade et al., 2000; Vachon & Klassen, 2008; Seiffert 2011).

In a less direct but no less shocking way, the high consumption of natural resources also occurs through the electric energy consumed by the industries, since for the resources can be used such as water (hydroelectric), wood (thermoelectric), among others (Van Bellen, 2006). In this way, the energy efficiency of industrial processes has also entered the agenda of environmental concern of the last decades (Costa, 2002). Therefore, the ways in which the activities of the transformation sector will influence the environment will depend specifically on the activities and processes in question (Almeida, 2006; Eidat et al., 2008).

The environmental conservation actions can be described as a systemic view of the interaction between industrial systems and natural systems, (i) through the study of material and energy flows in industrial systems; (ii) a shift from linear (open) to cyclic (closed) processes, (iii) where waste from one industry is a raw material for another; (iv) an emphasis on harmonious integration between industrial activity and ecological systems. The idea is making industrial systems more efficient and sustainable (Garner & Keolean, 1995; Ohnishi et al., 2012; Saraceni et al., 2013).

Given the current paradigms of Brazilian society, it can be said that it has been necessary for the country to undergo a process of sustainable development, since the literature shows that there are still many deficiencies in the Economic, Social and Environmental spheres (Tigre, 2006; Severo et al., 2015; Oliveira Brasil et al., 2016; Lucato et al., 2017; Severo et al., 2017; Scur & Barbosa, 2017).

The precarious reality of Brazilian industry in relation to competitiveness and innovation (pure or with technological increment) encouraged the development of this study. So, in order to find a path to encourage entrepreneurs to adopt environmental conservation practices, the main objective of this work was to respond the research guiding question: Does environmental conservation actions influences industrial competitiveness and innovation?

## THEORETICAL FRAMEWORK

In spite of efforts made aiming to create environmental awareness in society, literature has shown that only a small percentage of companies have a true commitment to this cause. Literature also shows that one of the main reasons for this attitude happens is due to, in addition to low awareness levels, the environmental conservation actions are not still considered determining factors for the stimulus of competitiveness and innovation.

Most part of publications found in literature are focused in validate the Porter hypothesis, seeking to fill the gaps and examine in which degree these relationships (innovation and competitiveness) occur (especially by means of econometric studies). Indeed, only a few works emphasize the ways such contributions occur, having importance in helping to understand entrepreneurs' awareness and vision.

Porter & Van der Linde (1995) discuss a theory that later came to be known as the Porter Hypothesis. In this sense, Porter discusses the existence of strict environmental regulations in which companies can induce increased organizational efficiency and encourage innovations, helping to improve their competitiveness.

Esty & Porter (1998) analyzed industrial environmental conservation actions in according to the concept of Industrial Ecology, and concluded that the Industrial Ecology approach mostly benefits companies seeking to improve their productivity and competitiveness. Still in according to the same authors, the systemic perspective of environmental conservation enabled by the Industrial Ecology can help companies to find paths in order to add value or reduce costs, both within their own production processes or throughout the whole supply chain

According to Ambec et al. (2011) Porter was an innovator by making such a claim and also by thinking in a way that opposed practically all the economists of that time, who believed that the existence of strict regulations decreases business possibilities, and consequently, the innovation and competitiveness of companies. Still according to the author's view, Porter hypothesis delineates that strict environmental regulations contribute to innovation and competitiveness, by strengthening the discovery and introduction of cleaner technologies with environmental focus (the innovation effect), making processes and products more acceptable therefore more efficient.

From the viewpoint of Frohwein & Hansjürgens (2005) analyzed the specific case of environmental regulations applied to paper and chemistry industries in European Union. From another viewpoint, Wagner et al. (2002) and Wagner et al. (2003) published a study entitled "The Porter hypothesis revisited: a literature review of theoretical models and empirical tests". Such contributions provided a more comprehensive approach to the topic than debates addressed in literature until then, based on theoretical or empirical investigations regarding the Porter theory.

Similarly, Ambec et al. (2011) conducted a broad review of key theoretical and empirical insights presented in literature over the past twenty years, discussing the policy implications of these analyses and also contributing in other aspects.

In according to Epelbaum (2004) industrial environmental conservation actions influence competitiveness and innovation due two main factors: (i) tangible (for example, by increasing operational efficiency) and (ii) intangible (such as brand value and increasing company reputation). The author stresses out that the influence level of the first variable in relation to the second depends from the type of process, products or sectors involved and their environmental impacts, and also the degree of concern and environmental awareness of the parties (company and consumers).

So, the implementation of an environmental management system according to ISO 14000 brings a series of competitive benefits, such as: cost reduction by reducing pollution and consumption of materials; in compliance with customer and investor criteria; improving overall management; and assisted image improvement (subject to the existence of other factors).

In addition to these findings, Young and Lustosa (2001) and Lustosa (2002) discuss other specific topics concerning this relationship, such as the impact of adopting environmental process technologies and its relationship within the Brazilian automotive sector. Their study describes the environmental performance and its relationship with competitiveness and innovation, in according to their findings; the performance of Brazilian sector is characterized by relative negligence on this subject, which eventually became one of the main causers of some of the most serious environmental problems. Withal, a new perspective has emerged in the nineties that associate environmental improvements with competitive gains.

Still according to Young and Lustosa (2001) and Lustosa (2002), an argument usually presented as a justification for lessening environmental control measures is that environmental costs reduce the competitiveness of national products in comparison to the countries of origin where these controls are non-existent. This standpoint is widely adopted in developing countries, being usually associated to the idea that the environmental issue is artificially imposed by developed countries based on the assumption that richer countries have already degraded their environment and now use the environmental issue to interfere in the economic development of poorer countries. Pollution is therefore considered unavoidable when trying to ensure industrial growth and, consequently, economic development.

In according to this dynamic perspective on the determining factors of competitiveness, it was observed that companies that access the international market show major concerns with environmental issues. Even more, data presented by the same authors seem to confirm that companies which engage R&D have greatest capacity to generate and adopt innovations, including environmental innovations. Process innovations aims to reduce environmental damage and environmental conservation strategies appear as factors that induce innovation, and are more clearly present in companies that attribute greater importance to their own R&D department.

Thus, justifications with practical implications for the conduction of this study were primarily based on two arguments: to encourage the implementation of environmental conservation actions in industries; to encourage (from a broader perspective) the promotion of sustainable development in developing countries by means of industrial environmental conservation actions resulting in increased competitiveness and innovation (aspects that are the driving force behind economic and social development) (Schumpeter, 1988; Freeman & Soete, 1997).



## RESEARCH METHODOLOGY

The first viewpoint adopted in this study was a systematic review on international literature in order to have the knowledge basis on different research perspectives (Lakatos & Marconi, 2001; Miguel, 2010). Additionally, a questionnaire was applied to a multi-sector group of 15 companies, in order to verify how these influences occur in practice, the results were useful to determine the differences between findings presented by literature and real-life events.

In this study, articles containing the research subject were obtained by searching the Scopus scientific database (containing about 19200 indexed journals). The searches were limited to studies published between 2009 and 2016, in order to gather the most recent information published on the subject. The Scopus database is considered the most relevant indexing platform for scientific papers in the world in terms of quantity and quality of indexed journals (Wang & Waltman, 2016; Moed et al., 2016). The key-words used in the search platform are shown in Chart 1.

**Chart 1**  
**Keywords used in the bibliographical search**

<b>Key-words</b>
Porter hypothesis
Environmental Management Competitiveness relationship
Environmental Management Innovation relationship
ISO 14000 Competitiveness and Innovation
Industrial Ecology Competitiveness
Industrial Ecology Innovation
Environmental Science
Environmental Management

The key-words search was made by following the application of the Knowledge Development Constructivist-Process (ProKnow-C), developed by Ensslin et al., (2010) aiming to select the most relevant articles on the subject. This procedure consists of the following steps:

- I. Selection of articles with titles aligned with the research topic;
- II. Selection, among the articles obtained in the previous step, of articles with abstracts aligned with the research topic;
- III. Selection of articles which the full content is aligned with the research topic

Articles regarding knowledge on the influence of industrial environmental conservation on competitiveness and innovation selected from the bibliographical portfolio were read and classified.

The bibliometric analysis (number of articles, authorship and temporal, regional and institutional distribution) of the surveyed articles is presented in the results section of this study.

### **Delimitation of Study Universe**

In order to identify a relation between the variables under study the following criteria for selection was adopted: companies with ISO-14000 certification were considered as having an indicative of corporate environmental responsibility and companies that are leaders in their segments or sectors due their competitiveness, which can be measured by the participation of these companies in their domestic markets (sectors). Furthermore, only companies classified as medium or large were selected. A criterion to defining companies with higher levels of innovation was not included due to the scarcity of data provided by the companies. Fifteen companies were chosen for this study being these located at a multi-sector industrial centre in the region of Campos Gerais – Paraná State, Southeast-Brazil.

### **Questionnaire**

Given the nature of the research guiding question, the elaboration of a questionnaire that could reveal the perceptions of the managers of environmental departments in each company was considered the most appropriate way to conduct the investigation.

In spite of the existence of qualitative indicators that seek to measure corporate variables of environmental behaviour, competitiveness and innovation, the qualitative interrogation was considered more appropriate because the aim of this study was to know the means through which relationships occur and not the intensity of these relationships.

The manager responsible for the industrial environmental department of each company was chosen to respond to the questionnaire as this would be the person inside the company that most significantly centralizes information regarding the environment and its implications. The comparison between theoretical and practical results was based on convergence, divergence and/or complementarily in according to the ways in which environmental conservation actions influenced competitiveness and innovation.

## **RESULTS AND DISCUSSION**

This section presents the bibliometric data concerning the articles used to create the bibliographical portfolio analyzed in research. This data available can be an important source to other researchers and policy promoters for the conduction of new studies and policies in this area thereby supporting this subject even more.

The search for articles with the selected key-words in the Scopus database between 2009 and 2016 (present) resulted in three hundred and eighty-two (382) articles. After application of the filtering criteria and considering access restrictions to the scientific platform, a total of thirty (30) articles were selected for the final bibliographical portfolio due to their significance for this study.

These articles were based on econometric or empirical research on companies of the second sector to show the main influence of industrial environmental conservation actions on competitiveness and innovation (especially innovations that strengthen competitiveness). Table 1 shows the number of selected articles according to the year of publication

**Table 1**  
**Classification of studies included in the bibliographical portfolio per year**

<b>Year</b>	<b>Number of articles of the bibliographical portfolio</b>
2009	1
2010	3
2011	5
2012	4
2013	7
2014	7
2015	2
2016	1

Table 1 shows an irregular trend concerning the number of published articles on the investigated subject throughout the years. The thirty articles analyzed in bibliographical research were published in twenty-six different journals, among which are listed in Table 2.

**Table 2**  
**Classification of studies included in the bibliographical portfolio per journal**

<b>Journal</b>	<b>Number of articles in the bibliographical portfolio</b>
Journal of Cleaner Production	3
Business Strategy and the Environment	2
Transportation Research	2
Contemporary Economic Policy	1
Journal of Economics & Management Strategy	1
Indian Growth and Development Review	1
Science Technology Society	1
Industry and Innovation	1
Oxford Bulletin of Economics and Statistics	1
Resource and Energy Economics	1
The World Economy	1
Environmental Policy and Governance	1
Ecological Economics	1
Journal of Applied Economics	1
Sustainability	1
Energy	1
Applied Economics	1
Energy Economics	1
International Journal of Production Economics	1
International Journal of Innovation Management	1
Accounting, Auditing & Accountability Journal	1
Expert Systems with Applications	1
Human Factors and Ergonomics in Manufacturing & Service Industries	1
Resources, Conservation and Recycling	1
Journal Plos One	1
Science of the Total Environment	1



This list shows that the Journal of Cleaner Production published the greatest number of articles in the bibliographical portfolio on the requested subject, with three articles, followed by Business Strategy and the Environment and Transportation Research, with two articles each. The remaining journals have only published one article each.

Table 3 shows the classification of studies included in the bibliographical portfolio per authors that have contributed.

**Table 3**  
**Classification of studies included in the bibliographical portfolio per author**

<b>Author</b>	<b>Number of articles in the bibliographical portfolio</b>	<b>Author</b>	<b>Number of articles in the bibliographical portfolio</b>
Chiang-Ping Chen	2	K. Narayanan	1
Chwen Sheu	2	Keng-Boon Ooi	1
Klaus Rennings	2	Kristina Söderholm	1
Akihiro Otsuka	1	Makiko Nakano	1
Alain Yee-Loong Chong	1	Marcus Wagner	1
Aldónio Ferreira	1	Md. Uzzal Hossain	1
Alonso Aguilar-Ibarra	1	Mika Goto	1
Andrea Bikfalvi	1	Nada Smigic	1
Andreja Rajkovic	1	Nick Johnstone	1
Ann-Kristin Bergquist	1	Nikola Tomic	1
Armando Sanchez-Vargas	1	Nivedita Dutta	1
Bayu Hendro	1	Paul Lanoie	1
Carly Moulang	1	Radomir Radovanovic	1
Chen-Lung Yang	1	Ricardo Mansilla-Sanchez	1
Chih-Hai Yang	1	Roberta de Santis	1
Chi Sun Poon	1	Roberto da Luz Neto	1
Christian Remmer	1	Rodolfo de Castro	1
Christopher Seow	1	Sai Ho Chung	1
Clandia Maffini Gomes	1	Sandwip K. Das	1
Claudia Ghisetti	1	Seda Meyveci Doganay	1
Colin C. J. Cheng	1	Selin Sayek	1
Dietrich Earnhart	1	Shu-Ping Lin	1
Dylan R. Rassier	1	Stanley Kam Sing Wong	1
Emiko Inoue	1	Stefan Ambec	1
Fatma Taskin	1	Thomas Ziesemer	1
Felix Groba	1	Toshi A. Arimura	1
Fiona Lettice	1	Toshiyuki Sueyoshi	1
Flávia Luciane Scherer	1	Todd BenDor	1
Frederic Marimon	1	T. William Lester	1
Hing Kai Chan	1	Tzu-Yun Chiou	1
Ilija Djekic	1	Uiara Gonçalves de Menezes	1
Indrani Roy Chowdhury	1	Voon-Hsien Lee	1
Isak Kruglianskas	1	Xi Yang	1
Jérémy Laurent-Lucchetti	1	Ya-Hui Chan	1
Joseph Llach	1	Yang Yao	1
Jinglei Gao	1	Yu-Hsuan Tseng	1
	1	Zengwei Yuan	1

A total of seventy-three individuals authored or co-authored the thirty selected articles, most of which (eighty) wrote only one article. Emphasizing those three authors published two articles each. The number of authors was greater than the number of articles because most articles were written by more than one author.

Table 4 shows the classification studies per institutions and countries that supported the publication of studies.

**Table 4**

**Classification of studies included in the bibliographical portfolio per institution/country**

<b>Institution</b>	<b>Country of institution</b>	<b>Number of articles in the bibliographical portfolio</b>
Centre for European Economic Research	Germany	2
Chung Hua University	Taiwan	2
Kansas State University	USA	2
Hong Kong Polytechnic University	Hong Kong	2
Bilkent University	Turkey	1
Boureal of Economic Analysis	USA	1
Cardiff University	USA	1
Central Research Institute of Electric Power Industry	Japan	1
Chang Jung Christian University	Taiwan	1
German Institute of Economic Research	Germany	1
Ghent University	Belgium	1
HEC Montreal Economics	Canada	1
Indian Institute of Technology Bombay	India	1
Jamia Millia Islamia University	India	1
JANA (NAB Group)	Australia	1
Jawaharlal Nehru University	India	1
Johns Hopkins University	USA	1
Kyoto University	Japan	1
Linton University College	Malaysia	1
Luleå University of Technology	Sweden	1
Monash University	Australia	1
Nagoya University	Japan	1
Hong Kong University of Science and Technology	Hong Kong	1
National Autonomous University of Mexico	Mexico	1
National Central University - Taiwan	Taiwan	1
National Cheng Kung University	Taiwan	1
National Kaohsiung First University of Science & Technol.	Taiwan	1
New Mexico Institute of Mining & Technology	USA	1
OECD Environment Directorate	France	1
Peking University	China	1
Santa Maria Federal University	Brazil	1

University of São Paulo	Brazil	1
Technical University of Munich	Germany	1
Toulouse School of Economics	France	1
Umeå University	Sweden	1
Universitat de Girona	Spain	1
Universitat Internacional de Catalunya	Spain	1
Université Louis Pasteur	France	1
Universiti Tunku Abdul Rahman	Malaysia	1
University of Alsborg	Germany	1
University of Belgrade	Serbia	1
University of Bern	Switzerland	1
University of Bologna	Italy	1
University of Chester	UK	1
University of East Anglia	UK	1
University of Baltimore	USA	1
University of Kansas	USA	1
University of Newcastle	Australia	1
University of Nottingham	UK	1
University of Roma La Sapienza	Italy	1
Waseda University	Japan	1
William E. Connor Group	Taiwan	1
Nanjing University	China	1
University of North Carline	USA	1

From the fifty-four institutions which contributed to the authorship or co-authorship, among the thirty articles included in the bibliographical portfolio, only four institutions contributed with the publication of two articles and the remaining institutions achieved one article each. The number of institutions that contributed with the publication of articles in the portfolio was greater than the number of articles because most articles were written in partnership between authors of several institutions. Table 5 shows the countries of origin of the published articles.

**Table 5**  
**Classification of studies included in the bibliographical portfolio per country**

Country	Number of articles from bibliographical portfolio
USA	7
Germany	5
Taiwan	5
China	3
Australia	2
France	2
India	2
Italy	2
Japan	2
UK	2
Hong Kong	2
Brazil	1
Canada	1
Spain	1
Belgium	1
Malaysia	1
Mexico	1
Serbia	1
Sweden	1
Switzerland	1
Turkey	1

As expected, most published articles were from developed countries which have emphatically contributed more to science in recent years. Table 6 shows that the influence of industrial environmental conservation actions on competitiveness and innovation were observed in thirty articles.

**Table 6**  
**Ways that industrial environmental conservation actions influence competitiveness and innovation according to the knowledge basis present in literature**

Influences	Number of companies that mentioned this influence
<b>Ways that influence occurs</b>	<b>Authors who contributed</b>
Cost and loss reduction	Wagner (2009); Ferreira <i>et al.</i> (2010); Rennings and Rammer (2011); Lanoie <i>et al.</i> (2011); Dutta and Narayanan (2011); Chowdhury and Das (2011); Ziesemer (2013); Inoue <i>et al.</i> (2013); Wong (2013); Sanchez-Vargas <i>et al.</i> (2013); Cheng <i>et al.</i> (2014); Lee <i>et al.</i> (2014); Ghisetti <i>et al.</i> (2014); Jinglei Gao <i>et al.</i> (2015).
Implementation of continued improvements (that can be considered the foundation of all the above-mentioned actions)	Yang <i>et al.</i> (2010); Todd BenDor <i>et al.</i> (2015).
Innovation of the company management system (organizational innovations) - changes in company management as a determining factor of company performance	Cheng <i>et al.</i> (2014)
Development of new products where environmental risk or impact is minimized - Green Research and Development	Wagner (2009); Rennings and Rammer (2011); Ziesemer (2013); Inoue <i>et al.</i> (2013); Wong (2013); Söderholm and Bergquist (2013); Cheng <i>et al.</i> (2014); Lee <i>et al.</i> (2014)
Increased operational/production efficiency - process innovations to meet environmental requirements that allow increased operational efficiency, such as through task and teamwork integration and other aspects or tools of Environmental Management.	Llach <i>et al.</i> (2012); Söderholm and Bergquist (2013); Goto <i>et al.</i> (2014); Ghisetti <i>et al.</i> (2014); Lee <i>et al.</i> (2014)
Increased productivity - process innovations to meet environmental requirements and that allow increased productivity	Yang <i>et al.</i> (2012); Sanchez-Vargas <i>et al.</i> (2013)
Improved company image in the market - increased market participation of certified companies	Yang and Yao (2012); Gomes <i>et al.</i> (2013); Djekic <i>et al.</i> (2014); Wagner (2009).
Revenue with by-products - such as revenue generation with recyclables or waste considered by Lee <i>et al.</i> (2014) as a way to recover investments	Rennings and Rammer (2011); Lee <i>et al.</i> (2014), Md. Uzzal Hossain <i>et al.</i> (2016).
Non-generation of export barriers given that, for example, the company meets ISO 14000 certification requirements	De Santis (2012); Groba (2014); Doganai <i>et al.</i> (2014)

Table 7 shows the responses of the questionnaire applied to the 15 investigated companies:

**Table 7**

**Ways that industrial environmental conservation actions influence competitiveness and innovation according to knowledge basis presented by the multi-sector group of companies studied**

Cost and loss reduction	4
Implementation of continued improvements (that can be considered the foundation of all the above-mentioned actions)	10
Innovation of the company management system (organizational innovations) - changes in company management as a determining factor of company performance	13
Developments of new products where environmental risks or impact can be minimized and correct selection of material to be used in the product.	12
Increased productivity - Increased operational/production efficiency	8
Revenue generation with recyclables	12
Non-generation of export barriers	11
Improved company image in the market	11

The knowledge basis obtained from systematic review (theoretical results) reinforced the responses of companies obtained from questionnaire (practical results). So it is clear that industrial environmental conservation actions have influence on competitiveness and innovation, mainly occurring through continued improvements, innovating company management system, developing new products with environmental risk or impact is minimized, processing innovations to meet environmental requirements thereby allowing to increase the operational efficiency, processing innovations meeting environmental requirements allowing to increase the productivity, revenue generation with recyclables or wastes, non-generating export barriers, and resulting in costs and losses reduction thereupon improving the company image in the market.

## CONCLUSION

Results showed a complementarily and convergence of knowledge, since results obtained from systematic review partly incorporated the responses from questionnaire, so results showed that in practice companies support the theoretical base established by the Porter hypothesis.. It can be seen that industrial environmental conservation actions have influence on competitiveness and innovation, thus answering the guiding question of this study. Therefore it is important to encouraging companies to adopt greener practices and processes, in order to maximize their profits in a sustainable way, a main objective in current business market and also one encourager for the occurrence of organizational changes.

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