Scientometrics (2019) 121:869–895
https://doi.org/10.1007/s11192-019-03201-0

Innovation in Latin America through the lens of bibliometrics: crammed and fading away

Julián David Cortés-Sánchez[1]

Received: 2 February 2019 / Published online: 31 August 2019

Abstract
Research in the field of innovation in business, management, and accounting (BMA) in Latin America (LATAM) has surpassed all expectations of its net output. Yet this digital tide suggests several concerns regarding its impact and both its established and emergent research topics at the individual, institutional, and country level. In this paper, an outlook of the field was developed based on a sample of + 1300 documents indexed in Scopus from 1983 to 2018. Public institutions in Brazil and Colombia have been both the most cited and productive in the region. Nevertheless, documents lead by non-LATAM authors showed significant differences in both paper citations and journals' *h*-index compared to leading authors from LATAM. Three of the major concerns raised were, first, a growing inter-regional gap among LATAM countries. Second, the intensive use of a journal with predatory features over the last 5 years, therefore cites/document measure is at the lowest point of the past 17 years. And third, the delay of recently emergent topics in the region that have been in the literature for more than a decade, while frontier topics for BMA innovation such as those of Industry 4.0 remain unnoticed.

Keywords Innovation · Business, management and accounting · Latin America · Bibliometrics

JEL Classification M10 · M40 · O30 · Z1

Introduction

The intellectual production in the field of business, management and accounting (BMA) in Latin America (LATAM) during the past 20 years has been impressive (Cortés-Sánchez 2018a). Between 1996 and 2017, 22,470 documents in the subject of BMA with at least one coauthor from LATAM have been indexed in Scopus (2018). Particularly, innovation-related research in BMA is one of several factors that identify activities related to firms' growth (Rosenbusch et al. 2011) and is now part of the global agenda for development, to be precise, Goal No. 9 of the Sustainable Development Goals: "Industry, innovation and

✉ Julián David Cortés-Sánchez
julian.cortess@urosario.edu.co

[1] School of Management, Universidad del Rosario, Bogotá, Colombia

infrastructure." (United Nations 2018). Reframing the query to documents with innovation as a keyword in BMA in LATAM between 1996 and 2018, + 1300 documents were found to be indexed in Scopus (2018). To navigate this amount of digital content, it is pertinent to use bibliometrics appraisal to assess document production and impact by authors, institutions, and countries, and the mutual influence between disciplines and the social capital of scholars (Zupic and Čater 2015).

The study of innovation in BMA in LATAM through the lens of bibliometrics has produced several developments, such as measurement frameworks (De Carvalho et al. 2017), industry relation (Manjarrez et al. 2016) and financing (Padilla-Ospina et al. 2018). Notwithstanding, several aspects remain to be studied and assessed, such as the regional context for the absence of research on innovation in the 1980s and 1990s, the specific peer-reviewed intellectual production on innovation in BMA in LATAM as far back in time as the 1980s, the particular bibliometrics features of relevant articles, books or book chapters (i.e., number of authors, citations, journal *h*-index, publishers, affiliations, languages, open access or paywall, and so forth) and research topics published. Accordingly, the research question guiding this study is: which are the bibliometric properties of the field of innovation in BMA in LATAM in terms of output and impact (citations) by countries, institutions and authors, and related topics in the last 30 years? Accordingly, the objective of this paper was to elaborate an outlook of the field of innovation in BMA in LATAM based on a sample of + 1300 documents indexed in Scopus from 1983 to 2018.

The rest of this paper is organized as follows: In the next section, the literature review is presented, followed by the methods underlying the study. Afterward, the results are both analyzed and discussed. Finally, the conclusions are outlined.

Literature review

Innovation is a multidisciplinary concept with numerous definitions (Baregheh et al. 2009). Particularly in BMA, innovation can be considered as the invention, improvement, and implementation of certain management practices, processes, structures, or techniques that are new and are intended to further organizational goals (Birkinshaw et al. 2008). That said, the studies related to both bibliometrics and scientometrics of innovation in BMA in LATAM reviewed centered around several topics, such as: measurements, cooperation, industry relations, business models, open innovation, financing, and social innovation. Also, these studies share certain methodological aspects, namely the source for bibliometric analysis.

As a measurement framework, De Carvalho et al. (2017) looked into innovativeness measures, comprising inputs (e.g., R&D [research and development] investments and staff qualification or patents); capabilities and processes (e.g., culture, leadership or knowledge); and outputs (e.g., number of innovations and percentage of revenues from new products). Along similar lines, Lazzarotti et al. (2011) and Lopes and De Carvalho (2012) spotted diverse themes related to Schumpeterian innovation and cooperation, such as resources and R&D (inputs); strategic alliances, performance, management, abilities and organizational skills, knowledge and learning (capabilities and processes); and technological innovation and new product development (outputs).

Regarding industry relations, Manjarrez et al. (2016) found in their bibliometrics analysis on industry relations with innovation system players (e.g., academic, scientific or technological) a worldwide development in the subject, not so in LATAM, except for in Brazil. Ceretta

et al. (2016) centered their analysis on business models and innovation and found that the key-terms most intertwined with those mentioned were market, management, strategy, R&D, and industry. De Paulo et al. (2017) conducted a comparative assessment between developed (i.e., G7) and developing countries (i.e., BRICS) and research production on Open Innovation. Among several findings, they highlighted a significant increase in the overall research output with a vast gap between groups in terms of publication output and citations: developed countries deployed a greater relevance whereas emerging countries are still in an embryonic stage. In financing on innovation, Padilla-Ospina et al. (2018) outlined five salient topics, namely: financial constraints, funding sources (internal and external), capital structure, venture capital, and financing of technology companies. When analyzing the topic of social innovation, Silveira and Zilber (2017) agreed that the term most associated with "social innovation" was "social entrepreneurship" and that the most implemented theoretical frameworks used to study social innovation were institutional theory, social entrepreneurship, and public policy.

With the above in mind, several similitudes can be underlined. First, the search criteria were centered on *innovation* + (*n*), in which *n* was an additional topic related to innovation (i.e., open, financing, business models). Second, except for Silveira and Zilber (2017), all other studies used *Web of Science* (WoS) as the leading system for bibliometrics analyses. And third, the average publication date ranged from 2000 to 2013.

Based on these shared properties, this study contributes to the literature on innovation in BMA from a regional comparative standpoint (i.e., LATAM) by using Scopus. This amplifies journal coverage (Scopus: 20,346 journals vs. WoS: 13,605) of both articles and journals published by countries in Ibero-America (e.g., Spain and Brazil) (Mongeon and Paul-Hus 2016), overlapping coverage (≈84% of active titles in WoS were also indexed in Scopus) (Gavel and Iselid 2008), and publication date to 1983–2018.

Methods

Descriptive statistics, correlations, ANOVA, text mining and co-authorship analysis were employed to comprehend the bibliometrics features of the intellectual production related to innovation in BMA in LATAM. Statistical analysis was conducted in SPSS and DIVE. Text mining and co-authorship analysis were processed in VOSviewer (van Eck and Waltman 2010). VOSviewer is an open-access software tool for constructing and visualizing bibliometric networks. In this study, the text mining functionality to construct and visualize co-occurrence networks of key-terms of the documents' titles and the co-authorship network visualization were used.

Sample

This study was focused on the publishing production on innovation framed into the context of BMA. According to SCImago (Table 1), this subject is made up of ten categories.

The search criteria in Scopus was limited to documents in BMA with the keyword *innovation (*or *innovación*) published as articles, conference papers, book chapters or books by at least one (co)author from Latin American. Bibliometric data were gathered on access type (e.g., open access); language; the number of authors; affiliation and country of the leading author; document title; abstract; year of publication; source title (i.e., journal, book or proceedings); journal *h*-index and quartile; and publishers' country. Scopus and SCImago were the sources for consultation.

Table 1 Subject categories in the subject of business, management and accounting in SCImago. *Source*: SCImago, n.d.

Subject categories
Accounting
Business and International Management
Business, Management and Accounting
Industrial Relations
Management Information Systems
Management of Technology and Innovation
Marketing
Organizational Behavior and Human Resource Management
Strategy and Management
Tourism, Leisure and Hospitality Management

Scopus found a total of 1330 documents published from 1983 to 2018. Table 2 presents the sample summary. Nearly half of the documents were published between 2015 and 2018, in which English was the dominant language and articles were the dominant source. In 16 out of 20 LATAM countries, it was found that there was at least one (co) author in a given document. About ninety percent of the documents had at least one (co) author affiliated to an institution located in either Brazil, Colombia, Chile, or Argentina. The complete database can be consulted in the following link: http://bit.ly/2ZL8G0i or by scanning the following QR code (Fig. 1).

Results analysis

Results are displayed in four sections. "Publishing market, citations and *h*-index distribution, and authors-citations correlation" section presents the distribution of the publishing market, citations and *h*-index as well as the results of the correlation between the number of

Table 2 Summary of the sample *Source*: Scopus 2018

Country	Documents published	Percentage (%)
Brazil	901	65
Colombia	200	14
Chile	84	6
Argentina	61	4
Peru	30	2
Source		
Articles	1115	83
Conference papers	198	14
Book chapters	18	1
Books	2	0,1
Language		
English	963	72
Portuguese	249	18
Spanish	166	12
French	2	0,1

Fig. 1 QR code to access dataset

authors and the number of citations. "Differences among groups of authors with LATAM and non-LATAM affiliations and citations, journal *h*-index and the number of authors" section presents the ANOVA results by comparing citations, the journal *h*-index, and the number of authors, classified in two affiliation groups: lead authors with a LATAM affiliation and lead authors with a non-LATAM affiliation. "Top 20 most-cited articles and most productive institutions" section analyzes the top 20 most-cited articles and most productive institutions. And "Text mining of documents titles and co-authorship network" section presents the text mining of document titles and the co-authorship network.

Publishing market, citations and *h*-index distribution, and authors-citations correlation

Overview information provided by SciVal for 2014–2018, found that 610 documents were published by 1565 authors producing a citation count of 3131, and 74 documents (12%) were published in the top 10% most cited publications worldwide. Six publishing groups represent 65% of the market publications (Fig. 2). One in four articles were published in the journal *Espacios,* published by *Consejo Nacional de Investigaciones Científicas y Tecnológicas* (CONICIT), Venezuela (it is different from CONICIT, Costa Rica).

No single document with *innovation* as the keyword was published between 1984 and 1988, representing the longest absence of the subject (5 years); followed by 1993–1995,

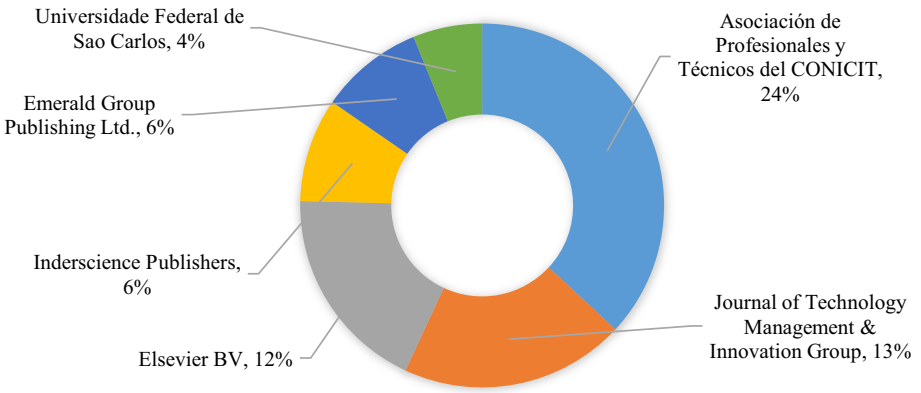

Fig. 2 Participation percentage of the publishers *Source*: Scopus (2018) and SCImago (2018)

the second longest (3 years); and 1997 and 1999. After these absences, came the eruption: since 2000, the average annual publishing rate had increased 321% annually. This production peak has not been translated into impact as 46% of the documents have no single citation.

Documents were segmented according to their *h*-index (i.e., *h*-index > 100, *h*-index 99 > 50 and *h*-index < 49) rather than quartiles (i.e., Q1, Q2, Q3 and Q4) given that some journals could be in Q1 either with a relatively low or a very high *h*-index. For instance, journals such as "E a M: Ekonomie a Management" was ranked in Q1 in BMA during 2014–2015 with an *h*-index of just 16, whereas the *Academy of Management Journal,* also ranked in Q1, has an *h*-index of 266. There is no point of comparison. To clarify, an entity, whether an author or a journal, has an index of *h* if *h* of the author's or journal's articles have at least *h* citations each and the remaining articles have ≤ *h* citations each (Hirsch, 2005). The mean *h*-index was 31.6. Figure 3 shows that both trends of documents (articles and proceedings) published from 1998 to 2017 with an *h*-index > 100 and between 99 > 50 have been virtually stationary; the increase came from documents published in either journals or proceedings with an *h*-index < 49. In fact, more than 300 documents were published in sources with an *h*-index of 6.

Concerning citation distribution, the mean number of citations in documents is 5.2, although 618 (46%) documents have no single citation, of which 226 (36%) were published in *Espacios.* By removing *Espacios* from the sample, the average number of citations increased from 5.2 to 6.6 (26%). Two-hundred and twenty-one documents (16%) only have one citation. The older documents tend to lump together most of the citations. Figure 4 shows that the number of citations/documents has progressively been decreasing since 2000, going from 33.47 cites/documents for the period of 2000–2002 to 1.5 for 2015–2017.

Besides the research output published in journals with *h*-index < 49, the number of authors by article has remained virtually unchanged. The average number of authors in the first half of the articles published from 1983 to 2013 ($n = 605$) was 3.07, whilst the average number of authors in the second half from 2013 to 2018 ($n = 606$) was 3.1.

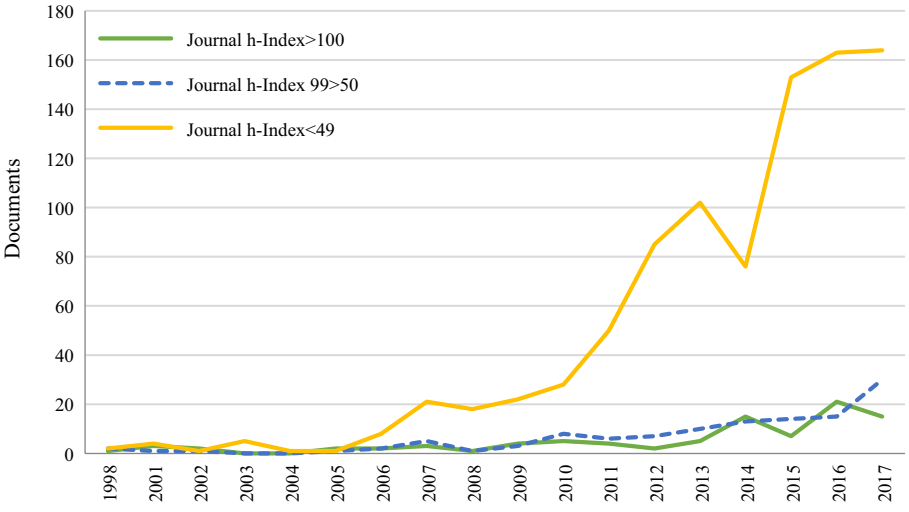

Fig. 3 Articles and proceedings published from 1998 to 2017 according to the *h*-index of the journal or proceedings *Source*: Scopus, 2018 & SCImago 2018

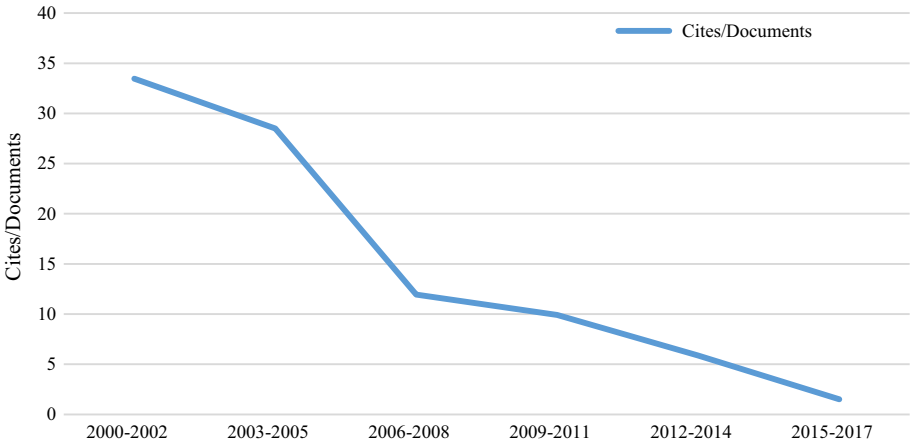

Fig. 4 Cites/documents from 2000-2017 *Source*: Scopus (2018) and SCImago (2018)

Correlational analysis showed no correlation between the number of authors and cites ($r = -.07$; $p < .05$). There was no correlation ($r = 0$) between the number of authors and journal/proceedings' *h*-index wherein the articles were published.

Regarding academic-corporate collaboration information provided by SciVal for 2014–2018, there were seven documents (1.1%) found. Table 3 displays the overview of these publications. These research topics were related to export diversification trough firm innovation, organizational practices in different cultures, and University-Industry relations, among others. Some of the corporate-related authors were affiliated with institutions such as Petrobras, the Central Bank of Chile, Morgan Stanley, and Accenture. The mean *h*-index for this subset was 73.

Differences among groups of authors with LATAM and non-LATAM affiliations and citations, journal *h*-index and the number of authors

Three ANOVA tests were conducted comparing citations, journal *h*-index, and number of authors by two affiliation groups: (1) leading author with a LATAM affiliation ($n = 1065$); and (2) leading author with non-LATAM affiliation ($n = 146$) (e.g., Spain [24%], United States [16%], or the United Kingdom [10%]). The ANOVAs comparing citations [$F(1, 1209) = 23.496$, $p = .000$] and journal *h*-index [$F(1, 1209) = 99.472$, $p = .000$] by affiliation groups were significant. In consequence, the mean scores in citations and journals' *h*-index for documents published by the group with a leading author with a non-LATAM affiliation (citations: $\bar{x}$=13, $\sigma = 17.1$; *h*-index: $\bar{x}$=62.8, $\sigma = 55.1$) were significantly different than the group with a leading author with a LATAM affiliation (citations: $\bar{x}$=4.4, $\sigma = 20.3$; *h*-index: $\bar{x}$=27.3, $\sigma = 41.9$). There were no significant differences among groups comparing the number of authors [$F(1,1209) = 3.478$, $p = .062$].

Table 3 Overview of academic-corporate collaboration. *Source*: Scopus (2018), SCImago (2018)

Title	Authors	Corporate institutions	Academic institutions	Year	Source	Source's *h*-index	Citations
Explaining export diversification through firm innovation decisions: The case of Brazil	Cirera, X., Marin, A., Markwald, R.	World Bank (USA)	University of Sussex	2015	Research Policy	206	10
Critical factors for transforming creativity into sustainability	Przychodzen, W., Przychodzen, J., Lerner, D.A.	Laureate Education (Netherlands)	University of Deusto	2016	Journal of Cleaner Production	150	8
Organizational practices across cultures: An exploration in six cultural contexts	Fischer, R., Ferreira, M.C., Assmar, E.M.L., Baris, G., Berberoglu, G., Dalyan, F., Wong, C.C., Hassan, A., Hanke, K., Boer, D.	Morgan Stanley (USA)	International Islamic University Malaysia, Victoria University of Wellington, Goethe University Frankfurt, Jacobs University, Anadolu University, New York University	2014	International Journal of Cross Cultural Management	41	6
Policies to Attract R&D-related FDI in Small Emerging Countries: Aligning Incentives With Local Linkages and Absorptive Capacities in Chile	Guimón, J., Chaminade, C., Maggi, C., Salazar-Elena, J.C.	Accenture (Spain)	Universidad Autónoma de Madrid, Lund University	2018	Journal of International Management	60	6
Making university-industry technological partnerships work: A case study in the Brazilian oil innovation system	Ferreira, M.L.A., Ramos, R.R.	Petrobras (Brazil)	Universidade Federal do Rio de Janeiro, Centro Federal De Educacao Tecnologica Celso Suckow Da Fonseca	2015	Journal of Technology Management and Innovation	22	3
Impact of knowledge obstacles on Chilean firms's innovation	Canales, M., Álvarez, R.	Central Bank Of Chile (Chile)	Universidad de Chile	2017	Journal of Technology Management and Innovation	22	3

Table 3 (continued)

Title	Authors	Corporate institutions	Academic institutions	Year	Source	Source's *h*-index	Citations
Innovativeness along the Business Cycle: The Case of Uruguay	Cassoni, A., Ramada-Sarasola, M.	Towers Watson (USA)	Universidad ORT Uruguay	2015	Latin American Business Review	11	1

Table 4 Top twenty: the most cited articles. *Source*: Scopus (2018) and SCImago (2018); and institutional websites

Position	Cites	Authors	Year	Title	Source title	Source's *h*-index	Publisher	Publisher's country	Lead author's country	Lead author's affiliation	Affiliation status
1	383	Perez C.,	1983	Structural change and assimilation of new technologies in the economic and social systems	Futures	66	Elsevier BV	Netherlands	Venezuela	Ministry of Industry	Public
2	355	Stilgoe J., Owen R., Macnaghten P.,	2013	Developing a framework for responsible innovation	Research Policy	191	Elsevier BV	Netherlands	United Kingdom	University of Exeter Business School	Public
3	159	Viotti E.B.,	2002	National learning systems: A new approach on technological change in late industrializing economies and evidences from the cases of Brazil and South Korea	Technological Forecasting and Social Change	86	Elsevier BV	Netherlands	Brazil	Senado Federal	Public

Table 4 (continued)

Position	Cites	Authors	Year	Title	Source title	Source's *h*-index	Publisher	Publisher's country	Lead author's country	Lead author's affiliation	Affiliation status
4	155	Naranjo-Valencia J.C., Jiménez-Jiménez D., Sanz-Valle R.,	2011	Innovation or imitation? The role of organizational culture	Management Decision	77	Emerald Group Publishing Ltd.	United Kingdom	Colombia	Universidad Nacional de Colombia	Public
5	114	Püschel J., Mazzon J.A., Hernandez J.M.C.,	2010	Mobile banking: Proposition of an integrated adoption intention framework	International Journal of Bank Marketing	68	Emerald Group Publishing Ltd.	United Kingdom	Brazil	Universidade de São Paulo	Public
6	108	Etzkowitz H., De Mello J.M.C., Almeida M.,	2005	Towards meta-innovation in Brazil: The evolution of the incubator and the emergence of a triple helix	Research Policy	191	Elsevier BV	Netherlands	United States	State University of New York at Purchase	Public

Table 4 (continued)

Position	Cites	Authors	Year	Title	Source title	Source's *h*-index	Publisher	Publisher's country	Lead author's country	Lead author's affiliation	Affiliation status
7	105	Calia R.C., Guerrini F.M., Moura G.L.,	2007	Innovation networks: From technological development to business model reconfiguration	Technovation	102	Elsevier Ltd.	United Kingdom	Brazil	FGV Business School	Private
8	102	De Medeiros J.F., Ribeiro J.L.D., Cortimiglia M.N.,	2014	Success factors for environmentally sustainable product innovation: A systematic literature review	Journal of Cleaner Production	132	Elsevier BV	Netherlands	Brazil	Universidade Federal Do Rio Grande Do sul	Public
9	102	Aldás-Manzano J., Ruiz-Mafé C., Sanz-Blas S.,	2009	Exploring individual personality factors as drivers of M-shopping acceptance	Industrial Management & Data Systems	81	Emerald Group Publishing Ltd.	United Kingdom	España	University of Valencia	Public

Table 4 (continued)

Position	Cites	Authors	Year	Title	Source title	Source's *h*-index	Publisher	Publisher's country	Lead author's country	Lead author's affiliation	Affiliation status
10	101	Chudnovsky D., López A., Pupato G.,	2006	Innovation and productivity in developing countries: A study of Argentine manufacturing firms' behavior (1992–2001)	Research Policy	191	Elsevier BV	Netherlands	Argentina	University of San Andrés (UdeSA)	Private
11	89	Jabbour C.J.C., Santos F.C.A.,	2008	The central role of human resource management in the search for sustainable organizations	International Journal of Human Resource Management	89	Routledge	United Kingdom	Brazil	University of Sao Paulo	Public

Table 4 (continued)

Position	Cites	Authors	Year	Title	Source title	Source's *h*-index	Publisher	Publisher's country	Lead author's country	Lead author's affiliation	Affiliation status
12	88	Matthing J., Kristensson P., Gustafsson A., Parasuraman A.,	2006	Developing successful technology-based services: The issue of identifying and involving innovative users	Journal of Services Marketing	81	Emerald Group Publishing Ltd.	United Kingdom	Sweden	Karlstad University	Public
13	83	Smith A., Fressoli M., Thomas H.,	2014	Grassroots innovation movements: Challenges and contributions	Journal of Cleaner Production	132	Elsevier BV	Netherlands	United Kingdom	University of Sussex	Public
14	81	Tontini G.,	2007	Integrating the Kano model and QFD for designing new products	Total Quality Management and Business Excellence	65	Routledge	United Kingdom	Brazil	Regional University of Blumenau - FURB	Public

Table 4 (continued)

Position	Cites	Authors	Year	Title	Source title	Source's *h*-index	Publisher	Publisher's country	Lead author's country	Lead author's affiliation	Affiliation status
15	75	Bonilla S.H., Almeida C.M.V.B., Giannetti B.F., Huisingh D.,	2010	The roles of cleaner production in the sustainable development of modern societies: an introduction to this special issue	Journal of Cleaner Production	132	Elsevier BV	Netherlands	Brazil	Universidade Paulista	Private
16	69	Carvalho M.M., Fleury A., Lopes A.P.,	2013	An overview of the literature on technology roadmapping (TRM): Contributions and trends	Technological Forecasting and Social Change	86	Elsevier BV	Netherlands	Brazil	University of Sao Paulo	Public
17	69	Spielman D.J., Ekboir J., Davis K.,	2009	The art and science of innovation systems inquiry: Applications to Sub-Saharan African agriculture	Technology in Society	40	Elsevier BV	Netherlands	Ethiopia	International Food Policy Research Institute	Private

Table 4 (continued)

Position	Cites	Authors	Year	Title	Source title	Source's *h*-index	Publisher	Publisher's country	Lead author's country	Lead author's affiliation	Affiliation status
18	68	Bogliacino F., Pianta M.,	2010	Innovation and employment: a reinvestigation using revised pavitt classes	Research Policy	191	Elsevier BV	Netherlands	Colombia	Universidad EAFIT and RISE-group	Private
19	66	Valencia J.C.N., Valle R.S., Jiménez D.J.,	2010	Organizational culture as determinant of product innovation	European Journal of Innovation Management	50	Emerald Group Publishing Ltd.	United Kingdom	Colombia	Universidad Nacional de Colombia	Public
20	66	Suarez F., Lanzolla G.,	2005	The half-truth of first-mover advantage	Harvard Business Review	154	Harvard Business School Publishing	United States	United States	Boston University	Private

Table 5 Top twenty: the most productive institutions. *Source*: Scopus (2018) and SCImago (2018)

Position	Institution	Country	Documents	Journal	Articles	*h*-index	Status
1	Universidade de Sao Paulo - USP	Brazil	183	Journal of Technology Management And Innovation	23	18	Public
2	Universidade Federal do Rio Grande do Sul	Brazil	60	Espacios	13	6	Public
3	Universidade Estadual de Campinas	Brazil	55	Journal of Technology Management And Innovation	13	18	Public
4	Universidade Federal de Santa Catarina	Brazil	50	Espacios	23	6	Public
5	Universidade Tecnologica Federal do Parana	Brazil	39	Espacios	19	6	Public
6	Fundacao Getulio Vargas	Brazil	38	RAE Revista De Administracao De Empresas	5	8	Private
7	Universidade Federal do Rio de Janeiro	Brazil	35	Espacios	5	6	Public
8	Universidad Nacional de Colombia	Colombia	37	Espacios	6	6	Public
9	Universidade Federal do Parana	Brazil	27	Espacios	12	6	Public
10	Universidade Federal de Santa Maria	Brazil	26	Espacios	14	6	Public
11	Universidade Federal de Sao Carlos	Brazil	25	Gestao E Producao	6	13	Public
12	Universidade de Caxias do Sul	Brazil	24	Espacios	9	6	Private
13	UNESP-Universidade Estadual Paulista	Brazil	23	Espacios	6	6	Public
14	Universidad Pontificia Bolivariana	Colombia	23	Espacios	17	6	Private
15	Universidade de Brasília	Brazil	20	Journal of Technology Management And Innovation	3	18	Public
16	Universidade Federal de Lavras	Brazil	19	Espacios	12	6	Public
17	Universidade Nove de Julho	Brazil	19	Journal of Technology Management and Innovation	6	18	Private
18	Universidade do Vale do Rio dos Sinos	Brazil	17	Espacios	3	6	Private
19	Universidade Cidade de Sao Paulo	Brazil	16	Journal of Technology Management and Innovation	6	18	Private
20	Pontificia Universidade Catolica do Rio de Janeiro	Brazil	16	Journal of Technology Management and Innovation	5	18	Private

Top 20 most-cited articles and most productive institutions

Table 4 presents the list of the 20 most cited papers in the sample. Eleven articles (55%) were led by authors from Brazil (8 articles) and Colombia (3 articles). Fourteen lead authors (70%) were affiliated with a public organization, mainly with the University of Sao Paulo, with three articles in the top 20. Elsevier owned 60% of the journals (e.g., *Futures* or *Research Policy*), followed by Emerald Group Publishing with 25% (e.g., *Management Decision* or *International Journal of Bank Marketing*). The average *h*-index of the journals is 91. The article: "Structural change and assimilation of new technologies in the economic and social systems" published in *Futures* is the most cited paper in the field in LATAM with 383 citations. It was authored by Perez, C. in 1983 when she was affiliated with the Ministry of Industry in Venezuela.

Table 5 presents a list of the 20 most productive institutions. The total number of articles published by these top 20 institutions is 752 (56% of the sample). Sixty-five percent are public institutions. Ninety percent of the institutions are located in Brazil (e.g. *Universidade de Sao Paulo* or *Universidade Federal do Rio Grande do Sul*) and 10% in Colombia (e.g., *Universidad Nacional de Colombia* and *Universidad Pontificia Bolivariana*). One out of four articles published by the top 20 institutions was published by *Universidade de Sao Paulo* (Brazil). In sixty percent of the institutions, the journal where manuscripts were submitted the most was *Espacios* (Venezuela), followed by *Journal of Technology Management and Innovation* (Chile) with 30%. The average *h*-index of the journals that were mostly used for publishing is 11.2. Only two institutions appear in both rankings: *Universidade de Sao Paulo* and *Universidad Nacional de Colombia*.

Text mining of documents titles and co-authorship network

A text mining of 1330 documents' titles (21,340 words) was conducted using VOSviewer. VOSviewer allows for creating maps based on text data (i.e., a co-occurrence map). Binary counting was considered: the presence or the absence of a term in a given text is calculated, independently of its number of occurrences. The minimum number of occurrences of a term to be included in the co-occurrence map was ten, therefore of the total of 3338 terms identified, 71 met this threshold. Several terms were omitted to reduce noise (e.g., countries and some nouns such as *analysis*, *effect, perspective*). Figure 5 presents the network visualization of co-occurrence terms and Table 6 presents the clusters by colors and top-five co-occurrence terms according to their link strength attribute: the total strength of the links, or co-occurrences, of a given term with other terms. The following analysis is focused on the key terms with the highest link strength of the top-three clusters and the new research key terms. Co-authorship network presented in Fig. 6 highlighted the prominence of authors affiliated with Brazilian institutions. Seventeen communities of authors (i.e., clusters) were identified. The largest community of authors comprised 21 members in which both Jabbour, C. (Montpellier Business School, France - H Index: 31) and Jugend, D. (UNESP-Universidade Estadual Paulista, Brazil - H Index: 7) were the members with the highest number of co-authors (red cluster). The following cluster comprised 13 members, related trough Gomes, C. (Universidade Federal de Santa Maria, Brazil - H Index: 5) and Kruglianskas, I. (Universidade de São Paulo, Brazil - H Index: 8) (green cluster).

Innovation and *knowledge* are both key-terms highly related to *management* (i.e., total quality management, supply chain management, environmental management). Therefore,

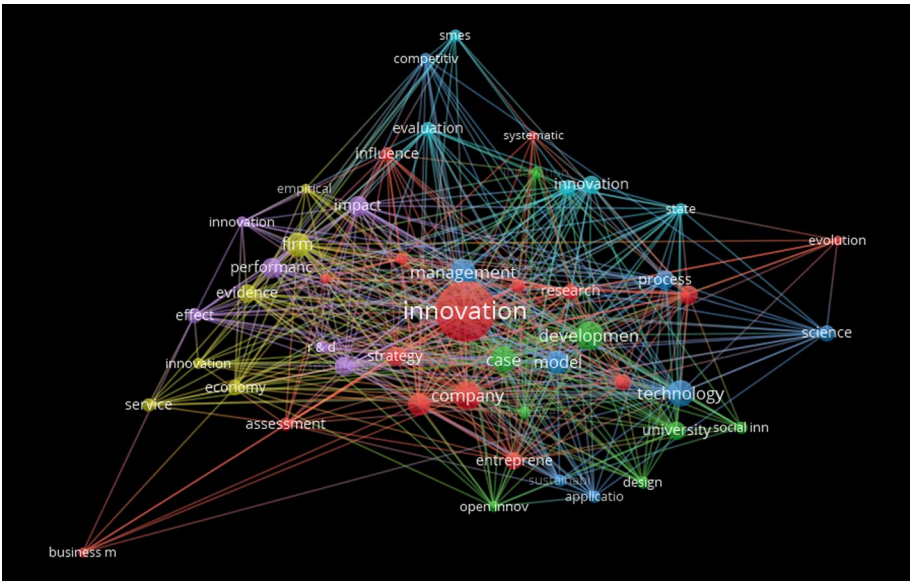

Fig. 5 Network visualization of co-occurrence terms. *Source*: author's own, based on Scopus (2018) and using VOSviewer

Table 6 Clusters by colors and top-five co-occurrence terms. *Source*: author's own, based on Scopus (2018) and using VOSviewer

Cluster 1 (16 items)		Cluster 2 (8 items)		Cluster 3 (8 items)	
Term	Link strength	Term	Link strength	Term	Link strength
Innovation	528	*Development*	138	*Technology*	139
Company	178	*University*	66	*Management*	121
Case study	106	*Knowledge management*	29	*Science*	67
Strategy	62	*Innovation process*	22	*Application*	27
Knowledge	56	*Open innovation*	21	*Sustainability*	27
Cluster 4 (6 items)		**Cluster 5 (6 items)**		**Cluster 6 (6 items)**	
Term	Link strength	Term	Link strength	Term	Link strength
Firm	111	*Impact*	85	*Network*	50
Evidence	64	*Innovation performance*	79	*State*	40
Economy	48	*Technological innovation*	64	*Evaluation*	39
Innovation capacity	23	*R&D*	29	*Innovation system*	36
Service	21			*SMEs*	20

both *innovation* and *knowledge* are resources to be *managed*. The titles expressed the relevance of either individual or multiple cases (studies) as methodological appraisal. The cases were not only focused on individual firms (e.g., a food company) but on countries (e.g., Brazil), regions (e.g., north-west of Bolivia), sectors (e.g., industrial sector), companies (e.g., ceramic cluster) or products (e.g., cameras). *Development* was mostly related to the development of firms, new technologies or products. In some cases, *development* was either sustainable or inclusive. Several studies referring to *Technology* were on road mapping, foresight, and future-oriented studies. The adoption and diffusion of technologies were also relevant topics among the most cited literature. In the case of *University*, studies were mostly concerned with the relation between University-Industry/Firms/Business and other paths of action towards an entrepreneurial university.

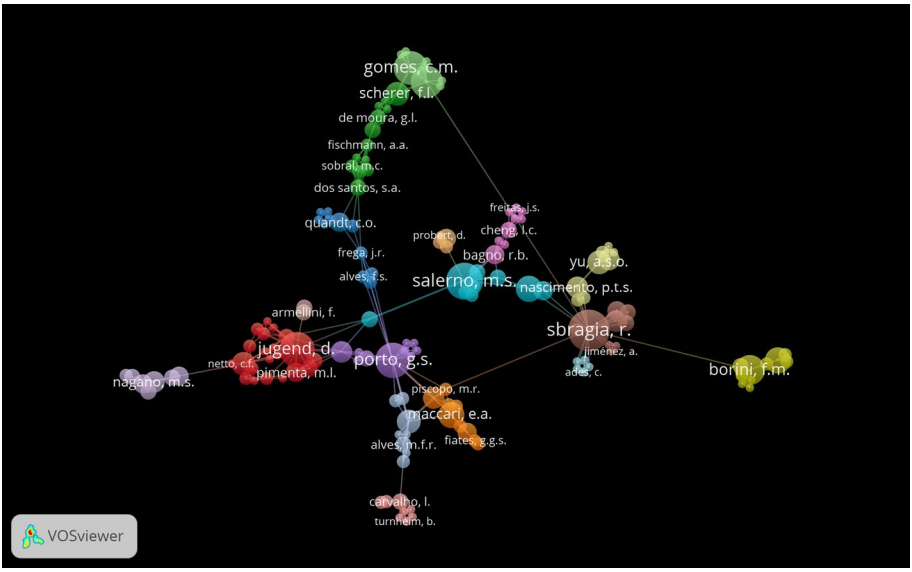

Fig. 6 Co-authorship network. *Source*: author's own, based on Scopus (2018) and using VOSviewer

In recent years (2014–2018), two topics have figured as emergent: *absorptive capacities* and *social innovation.* As stated by Cohen and Levinthal (1990, p. 128) in their seminal study, absorptive capacity is a firm's "*ability to recognize the value of new, external information, assimilate it, and apply it to commercial ends*". This capacity is crucial for innovation in BMA. Nevertheless, this topic figured as emergent in the LATAM context. Its first study was published in 2015, 25 years after that of Cohen and Levinthal (1990). One of the earliest references to social innovation in BMA, on the other hand, was proposed by Kanter (1999) (Phillips et al. 2015) who defined it as a perceived opportunity by society's private sector to develop ideas and innovations that produce both market and community benefits. In LATAM, this topic gained importance until 2013, 14 years after Kanter's contribution. As noted, research topics pointed as emergent in LATAM in the last 5 years, have been in the literature for more than a decade.

Discussion

Several countries in the region remain with no intellectual production on innovation in BMA. Specifically, six out of 20 countries, namely: Dominican Republic, El Salvador, Guatemala, Honduras, and Haiti. Hence, most of Central America and the Caribbean regions are falling behind the rest of LATAM. This distancing might create a profound inter-regional gap, as countries such as Brazil and Colombia published 80% of the documents in the region.

The article was the main pathway for research diffusion as 83% of the sample's documents were comprised of articles and only 0.1% of books. When it was asked to 20,000 members of the *Academy of Management* on indicators of scholarly impact and beneficiaries for institutional support, they answered to the former: (1) scholarly articles in top-tier

Fig. 7 Question on publishing incentives in Research Gate. *Source*: Research Gate (2014)

journals, and (2) scholarly citations in others' research; and the latter: (1) publication in top-tier journals, (2) scholarly citations by others, (3) obtaining research grants, (4) published books, and (5) publication in practitioners' journals (Haley et al. 2017). Another reason for the scarce presence of books is the general unavailability of books on academic platforms. This is, nonetheless, in the process of changing. For instance, since the initiation of the Book Titles Expansion program of Scopus in 2013, the goal of indexing 75,000 books has been reached (Elsevier 2013). Up to 2016, 120,000 books were already indexed.

Globally, the English-language has become the default academic language. In fact, 72% of the documents we used were published in English and only 12% in Spanish. Simply put, if a scholar from a non-Anglophone country, as in LATAM, does not publish research in English, he or she has become merely a consumer of knowledge instead of a producer of it (Tardy 2004). Incentives are also behind this. English-medium publishing is a bonus for tenure and academic promotion (Bocanegra-Valle 2014). For instance, Fig. 7 shows a question asked in a ResearchGate forum 4 years ago on publishing incentives. The person who asked also uploaded a list of financial incentives according to journals in the case of Turkey. The average incentive for publishing in management-related journals was US$638, the equivalent of 2.6 the minimum wage in Turkey (i.e., ₺ 1600 up to 2018). Hence, the mot: "Publish or perish" is incomplete. A better version would be: "Publish in English or perish".

The dominant countries of (and out of) LATAM were Brazil and Spain. During the past 22 years, both Brazil and Spain published 33,471 documents in BMA, representing 65% of the overall publications in Ibero-America (Cortés-Sánchez 2018a). The absence of research in the field that took place between 1984 and 1988, could have been caused by, among others, the *Década Perdida* (The Lost Decade): a period of major financial crisis in the region. Arocena and Sutz (2001) outlined a regional diagnosis on several and multidimensional constraints for innovation during the period, such as: (1) the stagnation of the budget of public universities (for instance, the numbers in Chile were shocking as the public budget for higher education dropped by 37.2%); (2) the low importance given to endogenous

knowledge production and the low involvement of industry with R&D; and (3) the 'structurally unachieved' building of National Systems of Innovation.

Concerning the market participation of the publishers, it raised a major concern. Larivière et al. (2015) found that only five publishers account for more than 50% of all papers published in 2013 (e.g., Reed-Elsevier and Wiley-Blackwell). In spite of this, for a researcher, it is feasible to relate journals of Elsevier such as *Research Policy* to top-tier research on *innovation.* In LATAM the scenario is frustrating. One out of four papers were published by CONICIT. Unlike the association between Elsevier-*Research Policy*¸ the only journal CONICIT publishes is *Espacios.* As the author of this study has publicly stated (Cortés-Sánchez 2018a, b), this journal has several characteristics of a predatory journal (Shamseer et al. 2017; Beall 2015) despite being indexed in Scopus, such as: poor web design; (hyper) short time for peer reviewing and publishing (sometimes it takes less than a week for publication); low processing charge (US$150) considering that the average article processing charge in the Directory of Open Access Journals is US$964 and the mode is US$0 (Morrison et al. 2015); and exponential rate of publishing (only in 2017, more than 1700 articles were published) (SCImago 2018). The approximate calculation was US$255,000 of income for *Espacios* only in 2017. The explosion of articles published in journals with an h-index < 49, mostly emanates from *Espacios* (h-index of 6). Regardless of the proliferation of English-language publications in LATAM, the h-index journals overall trend has been diminishing throughout the years.

Furthermore, the detonation of output does not correlate with neither visibility nor impact. Forty-six percent of the documents do not have a single citation, which is a number close to that stated by Hamilton (1990) of 55% of the papers published never being cited after 5 years, and way far from that stated by the same author of 77% of the papers on business never being cited after 4 years of their publication (Hamilton 1990). Only six percent (220) of the documents have received at least one citation. As time has passed, the relation between cites/documents has been decreasing to the minimum in 2017. The undisputed outliers were the studies entitled "Structural change and assimilation of new technologies in the economic and social systems" and "Developing a framework for responsible innovation", authored by Perez (1983) and Stilgoe et al. (2013) respectively, with 383 and 355 cites each.

Research on University-Industry relation is a different tale from academic-corporate collaboration. In terms of net output, while 23 documents on the relation between University-Industry/Enterprise/Firm have been published since 2000s (e.g., Sutz 2000; Zawislak and Dalmarco 2011) only seven have been published with at least one co-author affiliated with a corporation since 2014 (e.g., Cirera et al. 2015; Przychodzen et al. 2016). An interesting aspect to be highlighted, is that regardless of the little involvement of corporate organizations as co-authors, those organizations figured as either one of the biggest firms in the sub-continent (i.e., Petrobras), a national bank (i.e., Central Bank of Chile), or major multinational companies (i.e., Accenture). Also, the articles published by the latter group are being published in journals with a mean h-index (73) way above the mean h-index index of the whole sample (31.6). Sutz (2000) outlined several strategies to improve the University-Industry relation in the LATAM context, worth mentioning in this study, such as the exchange of information between Universities-Industries concerning capacities for problem solving and knowledge needed from both sides, focusing on some type of enterprise branch to raise competence pools between faculty and firms, and more legitimization that both actors can achieve gains from their joint strategies.

Individual researcher as a lone-wolf type is decreasing, even more as doing big-science (De Solla Price 1963) would be the next port to reach. In spite of that, the number of authors by paper (i.e., as a proxy of the social capital and collective work on research

developing and publishing) in the sample studied remains unchanged. Wuchty et al. (2007) argued that over the past 45 years, the average number of authors per paper has increased from 1.9 to 3.5. In the subject of management, Acedo et al. (2006) found that the average number of co-authors in the subject was 2.8. On innovation related-studies, Lazzarotti et al. (2011) identified an average of 1.8 authors by article. In this study, the average number of authors of the nine papers published prior to 2000 was 1.8. Hence, after 2000 the average increased in 1.2 authors per paper, from 1.8 to 3.07. This average is approximate to that of Acedo et al. (2006). Nevertheless, the sample prior to 2000 is too small to conclude anything. Acedo et al. (2006) also found that articles with two authors seem to have a greater impact, yet in this study no correlation was found between either number of authors and cites, or number of authors and *h*-index wherein articles were published. Similar conclusions were pinpointed in the field of chemistry since no correlation was found between the strength of a co-authorship and the relative citation eminence (Glänzel and Schubert 2001). Comparing citations, journal *h*-index, and number of authors by lead authors from LATAM and non-LATAM countries, resulted in significant differences. A document featuring a leading author outside LATAM is usually more cited and published in a journal with a higher *h*-index. This reinforces the thesis that foreign English-written research is more consumed by peripheral regions, such as LATAM (Tardy 2004).

Lead authors from Brazil and Colombia domain the top 20 most cited articles in the field. Both countries are the most productive as well as the most visible in terms of citations. It is also remarkable the dominance of public institutions in both countries, regardless of the lack of government funding for research and development (R&D) activities. From 2006 to 2016, the annual R&D investment in Colombia was 0.2% of GDP on average, meanwhile in Brazil was 1.1% from 2006 to 2015 (The World Bank 2018). On the other hand, public investment in tertiary education (i.e., public universities listed in the top 20), as well as the percentage of public expenditure on education in both countries, have considerably increased. From 2008 to 2017 that percentage was 20.7% per year on average in Colombia, meanwhile it was 17.4% from 2006 to 2015 in Brazil (The World Bank 2018). It seems that financial resources for higher education have been fundamental for the research in innovation in LATAM and its related impact. It is crucial to observe, nonetheless, that a proportional relationship between R&D activities and their research impact is not clearly established. For instance, in the health sciences field, Jacob and Lefgren (2011) estimated that a receipt of a National Institute of Health research grant leads to only one additional publication over the next 5 years and a small effect on further citations.

Elsevier owned 60% of the journals in the top 20. This percentage is similar to the 70% of articles published by only five editorials (i.e., Reed-Elsevier, Wiley-Blackwell, Springer, and Taylor & Francis) in social sciences (Larivière et al. 2015). Indicators of scholarly impact and beneficiaries of institutional support are anchored in publications in top-tier journals, that are partly owned by those same editorials. Same journals and editorials will maintain their oligopoly as researchers on the field they seek (and dream about) to get published as well as being read and cited in those same journals. Nevertheless, the current situation in the region is far more endogenous. The most productive institutions keep publishing most of their research in regional journals, one of them with evident predatory features (i.e., *Espacios*). Regardless of the comparative advantage they have for being open access journals, the average *h*-index of the most used journals of the region is almost a tenth of the average *h*-index of the journals in the top 20.

Previous text mining studies conducted at a regional level have shown a few similarities. Favaretto and Francisco (2017) conducted a text analysis of the archive of the journal *Revista de Administração de Empresas* (Journal of Businesses Administration) from

1961 to 2017. By comparing the most used words in article titles among both that and this study, a similarity was found among *administração* or *gestão* (administration or management) and *caso* (case). *Indústria* (industry) and *tecnologia* (technology) also appeared below the top-ten. The relevance of *management* of (and related to) *innovation* was also pinpointed by Lopes and De Carvalho (2012) and Ceretta et al. (2016). In addition, the link between (social) innovation and social entrepreneurship described by Silveira and Zilber (2017) was also found with additional particularities. Both key-terms *social* and *entrepreneurship* did not reach the top-ten but the top-50. Similarly, they were commonly related (e.g., *How social entrepreneurs in the third sector learn from life experiences*). Individually related, *social* appeared the most next to *knowledge*, *technology* and *companies*. In spite of its mutual companion, *social* was a key-term with more centrality and importance with *innovation* than *entrepreneurship.* There was no difference between the methodological appraisal (i.e., case) between *management* in general and *innovation* in particular. This might be one of the reasons it has been difficult for scholars from LATAM to publish in top-tier journals. We looked into 1667 articles of the *Academy of Management Journal,* and then searched for the key-term *case* among the articles' titles: only 23 explicitly mention the *case* as a methodological appraisal. To be highlighted, the most cited article of this journal is entitled: *Theory building from cases: Opportunities and challenges* with 4345 citations (Eisenhardt and Graebner 2007). This research aims to take a step further with the cases in order to emanate theory from them. Simply put, to reach top-tier journals, research from LATAM should propose theory-oriented research instead of case-based.

In terms of emergent topics in the last 5 years (i.e., *absorptive capacities* and *social innovation*), such topics have been in the body of literature of BMA for more than a decade. In LATAM, however, these have only been a matter of study since 2013. Topics related to Industry 4.0 that are going to be radically transformative for innovation in business in the upcoming years such as Artificial Intelligence, Big Data, Internet of Things, Smart Industry and Smart Manufacturing, Cloud Computing, among others, are not part of the current research agenda (Muhuri et al. 2019). This dearth of LATAM research from the frontiers of innovations in BMA suggests several concerns on the participation of the region in the conversation with researchers and institutions from the global north.

Conclusion

Research on innovation in BMA from LATAM has surpassed the expectations in terms of net output, yet its current impact and inter-regional gaps outline several concerns for the field in the upcoming years. First, six out of 20 countries from LATAM remain with no intellectual production on innovation in BMA. This detachment creates a profound inter-regional gap between Central America and the Caribbean, and the rest of the countries from LATAM.

Second, the BMA global-north scholars' community has always been a major influence for that of LATAM. Business and Management Schools in LATAM are increasingly pursuing international accreditations (i.e., AACSB) and standards, and this trend does not seem to be halting. An English-fluent faculty and articles both published and cited in top-tier journals (the majority published in English) are now one of the indicators for international accreditations and attractive incentives.

Third, the financial crisis of the 1980s known as The Lost Decade shocked and essentially muted the research on innovation in the region, followed by two more periods.

Only after 2000, this research subject skyrocketed its intellectual production. In the last 18 years, one out of four articles has been published in a journal with several predatory features. In spite of this, this is a rounded business for editorials as such. And the business is *bullish*. The aftermath of this misadventure is that it might cause an unmeasured discredit for the future of research on innovation from the region. In addition, almost half of the articles published lack a single citation, and the relations cites/documents do not show any symptom of increasing, while the social capital remains static and inter-regional.

Fourth, *management* and *innovation* were the most strongly related key-terms of research. In addition, despite *innovation*, *social*, and *entrepreneurship* being related, *social* was the prominent, and also related to other relevant key-terms such as *knowledge* and *technology*. The *case* was noticeable as the methodological appraisal on innovation research on BMA by default, which is not the case in the top-tier journals as theoretical perspectives have been the most discussed. Recent research topics such as absorptive capacity and social innovation have been in the literature for more than 15 years and game-changing topics for innovation in BMA such as Industry 4.0 are not noticeable in the current co-occurrence map. The absence of intellectual production in LATAM on these topics might be a major concern for researchers, business schools, and research institutions in general, which limits their ability to participate in the global conversation of high-tech trends in BMA research.

The results obtained in this study provide an outlook to be considered for research evaluation entities and scholars on the subject of BMA and innovation. The open access dataset also allows for the replication or triangulation of the data in further studies, to locate influential studies or researchers, to measure inter-regional production gaps and topics of research, among either academic or practice-related interest. Future studies could compare the differences between different bibliometrics and scientometrics platforms, such as Google Scholar, WoS or Dimensions. Methodological appraisals such as co-authorship or co-citation analysis could also amplify the understanding of the researchers' social capital. Furthermore, comparative analyses considering additional groups of countries (e.g., Europe or Asia) would facilitate to place LATAM in a global perspective. Finally, one of the greatest unresolved questions is the cause of intellectual production backwardness in Central America and the Caribbean. Further studies should consider the identification of the root cause(s) of inter-regional inequalities, and the pathway for LATAM institutions to participate and contribute in research topics that are changing the innovation and business dynamics worldwide.

Acknowledgements The author would like to thank to Universidad del Rosario's School of Management. Also, thanks to Dr. Julia Jensen for her proofreading assistance.

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