Supply chain management in Latin America: current research and future directions

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Abstract

Purpose – For the past 20 years, Latin American countries have gone from being a low-cost region to significant players in the world economy, with five of its countries ranked among the world's 50th largest by gross domestic product. This paper aims to study the contribution of Latin American researchers in the field of supply chain management (SCM) to aid an understanding of the Latin American impact within global supply chains (SCs).

Design/methodology/approach – The authors present a study which includes a bibliometric analysis of the papers authored by Latin American researchers in the SCM field and which were exclusively published in journals included in the Journal Citation Reports. In addition, the authors conducted a survey to Latin American researchers and consultants to gain greater understanding of the main difficulties, which in their opinion, have negatively affected the SCM area in Latin America within the past five years, and identify possible misalignment between Latin American research and the challenges for SC in the region.

Findings – The results show that Latin American research on SCM in the past nine years is not significant for the field considering the number of papers, citations and the papers published in top journals. Another interesting finding is the lack of collaboration among researchers from different Latin American countries, as well as with corporate. Finally, survey results reveal significant differences regarding the main difficulties each country perceived as relevant.

Practical implications – Comparing results from both analyses, relevant misalignments stand out between published research and the main difficulties detected. These suggest a challenging opportunity for Latin America, emphasizing the need to increase research contribution of the scientific community, through collaboration and alignment toward overcoming the most troublesome difficulties for Latin America. Therefore, the authors suggest future regional research directions which could also help global companies to tackle the challenges faced and optimize performance of their Latin American SCs.

Originality/value – To the best of the authors' knowledge, no previous research on the quality and impact of Latin American research in SCM has been conducted. Also, misalignments between researchers and practitioners in the region, which allow identifying weaknesses of Latin American SCs, have not been studied before.

Keywords Research, Impact, Global supply chain, SCM competency, SCM performance

Paper type Research paper

1. Introduction

Latin America (LATAM) comprises 20 countries: Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Costa Rica, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, The Dominican Republic, Uruguay and Venezuela. Its total population accounts for more than 625 million people, while its total gross domestic product (GDP) totals around 5 per cent of the Gross World Product according to ECLAC (2016) report. Although the region achieved considerable success in reducing extreme poverty over the past decade, its levels of income and wealth inequality remain high and have stymied sustainable growth and social inclusion. Albeit income inequality has fallen in recent years, LATAM remains the most unequal region in the world, considering the GINI index (Barcena and Byanyima, 2016). This region, whose native languages are predominately Spanish and Portuguese, has different characteristics from the supply chain (SC) point of view. Its population is highly urbanized (79 per

The current issue and full text archive of this journal is available on Emerald Insight at: **www.emeraldinsight.com/1359-8546.htm**

Supply Chain Management: An International Journal
 [ISSN 1359-8546]
[DOI 10.1108/SCM-07-2017-0236]

Received 13 May 2017
Revised 13 July 2017
29 November 2017
13 April 2018
1 June 2018
27 June 2018
Accepted 28 June 2018

cent), living in some of the largest metropolitan regions in the world. Nevertheless, isolated and rural regions needing tailored infrastructure solutions are still evident (Blanco and Paiva, 2014). Despite being a diverse, multicultural region and having different climates and geographical features, LATAM is now considered a large potential market (IDB, 2016).

For the past 20 years, Latin American countries have gone from being considered just a low-cost region to significant players in the world economy (Ruiz-Torres *et al.*, 2012), with five of its countries ranked among the world's 50 largest by GDP. Region importance has grown since several worldwide companies focus is to position a product in specific markets and outsource manufacturing processes to third parties. Latin American SC challenges are numerous and complex, with companies facing problems such as: poor infrastructure, expensive and inefficient logistic networks, lack of economic integration, burdensome government bureaucracy and procedures, limited supply of trained professionals, political and economic uncertainty, social concerns, geographical obstacles, poor supplier relationships, among others (Carneiro and Brenes, 2014; Ruiz-Torres *et al.*, 2012; Tanco *et al.*, 2015). In addition, more than half of the Latin American workforce, including the "emerging middle class" or "middle sectors", works in the informal sector (Melguizo, 2015).

With the aim of boosting economic development and improving national welfare, countries draw on competitive advantages resulting from the investment on R&D, especially in the science and technology area (González-Brambila *et al.*, 2016). However, Latin American countries show low levels of investment in R&D (as a per cent of the GDP), low number of patents (as a per cent of population), a moderate amount of papers published in scientific journals (per 100 researchers) and low number of full-time researchers as a percentage of total employment (González-Brambila *et al.*, 2016). In particular, empirical evidence suggests that more research is needed, especially in the business management field with special focus on LATAM (Elahee and Vaidya, 2001; Carneiro and Brenes, 2014; González-Brambila *et al.*, 2016). In view of these limitations, Martínez and Kalliny (2012) identify three main challenges for empirical research in LATAM. The first challenge is the lack of proficiency/technical English competence, the second is the difficulty obtaining data from companies (mainly because they worry about how it may be used) and the third is to have problems achieving a decent response rate in surveys. In addition, Batres-Pérez *et al.* (2012) suggest that Latin American research success depends greatly on designing innovative data collection, and establishing research partnerships among Latin American faculties, researchers and trading communities to foster the creation of a cluster of knowledge.

The aim of this paper is to discuss on the contribution of Latin American researchers in the field of SCM, by developing a bibliometric analysis. In addition, we discuss an exploratory survey conducted to Latin American researchers and consultants regarding the main difficulties they consider to have the highest negative impact on the field of SCM in LATAM during the past five years. Our survey is based on a list of 18 difficulties identified by Tanco *et al.* (2015). The results of the bibliometric analysis and the exploratory survey enable a better understanding of the vision academics have regarding the field of SCM. This allows identifying misalignments between published articles and researchers vision about SCM, for the purpose of suggesting future research directions in SCM for Latin American researchers.

To the best of our knowledge, no previous research about the quality and impact of LATAM research in SCM has been conducted. However, similar studies in other parts of the world, such as China or other emerging economies, have been published, highlighting the importance of this study to gather scientific knowledge globally representative of SCs. Our hypothesis is that Latin American research in SCM is scarce (in terms of quantity and quality) in the worldwide scientific community and there is a misalignment between the views of practitioners and academics, which is also consistent with González-Brambila *et al.*'s (2016) findings.

This paper is structured as follows. In Section 2, we present our research methodology, that includes a discussion on the bibliometric analysis of the papers written by Latin American researchers on SCM and published in the Web of Science (ISI Web of Science[SM] database) and our survey conducted on researchers and consultants from LATAM, regarding the main difficulties of SCM in LATAM. We include the characterization of the response and a deep survey analysis, using statistical methods. Using the results of these analyses, in Section 3, we discuss the contributions of Latin American researchers to the field of SCM. In Section 4, we discuss the main difficulties hindering SCs in LATAM, and in Section 5, we present our findings regarding the quality and quantity of the Latin American research in SCM. Finally, in Sections 6 and 7, we propose a future research agenda for SCM in LATAM and present our conclusions, respectively.

2. Methodology

The main objective of this paper is to achieve a better understanding of SCM in LATAM from the academic perspective, and thus, we aim to analyze the contribution of Latin American researchers to the SCM body of knowledge, by answering the following research questions:

RQ1. Is the number of papers produced by Latin American researchers relevant for the SCM body of knowledge?

RQ2. Is the number of high quality papers (measured as those published in top journals) produced by Latin American researchers comparable to the whole research in the area?

RQ3. Is the impact of papers produced by Latin American researchers (measured in number of cites per paper) comparable to the whole research in the area?

RQ4. Is Latin American research more analytical and theoretically oriented?

In addition, this paper aims to study the core difficulties of LATAM which researchers and consultants consider to have the highest negative impact on SCM in LATAM. Therefore, we state the following research questions:

RQ5. Which are the main difficulties identified for the Latin American region?

RQ6. Which significant differences exist among the difficulties identified within the region?

Based on the results of the aforementioned research questions, we present the following research question:

RQ7. Is the research carried out by Latin American researchers aligned with the main difficulties of SCs in LATAM?

To find answers to these questions, deepening the understanding of SCM in LATAM and generating a richer discussion, we carried out two independent but complementary approaches: a bibliometric analysis and a survey. The next section discusses both methodologies.

2.1 Bibliometric analysis

A systematic literature review was conducted throughout the ISI Web of Science[SM] database (onwards WOS) with the aim of answering *RQ1*, *RQ2*, *RQ3* and *RQ4*. We restricted our search to peer-reviewed journals, and thus, our study considers all significant research that is available in the rest of the world. However, we voluntary excluded some other articles that were published in local journals (mostly in Spanish or Portuguese), as their quality is difficult to evaluate and databases for a systematic literature review are not available.

As SCM has been a melting pot of various disciplines (Logistics, Transportation, Operations Management, Distribution, Marketing, Purchasing, etc.), the literature is still very fragmented (Giunipero *et al.*, 2008). As a boundary-spanning field, boundaries are hard to assess and may be splintered in nature because of its close interaction with flows from other disciplines. There exist several literature reviews compiling SC journals such as Giunipero *et al.* (2008), Menachof *et al.* (2009) and Defee *et al.* (2010). Recently, a SCM Journal List[TM] was created to annually evaluate universities SCM research output. This is based on the research published on eight "leading" supply chain management (SCM) journals. The list, which will be updated in 2020, is currently endorsed by more than 150 universities and 330 researchers of the field.

For the bibliometric analysis, we include journals from the SCM Journal List[TM] indexed in the "Management" category of the Social Science Edition (SSCI) at the Journal Citation Reports (JCR), or those journals with the keywords "Operations Management", "Supply Chain" and "Logistics" in their journal title. As a result, 14 journals were selected. Meeting this criterion, we only excluded *Production and Operations Management* (listed in the SCM Journal list, but excluded from the SSCI Management category), *Transportation Journal* (only listed in Defee *et al.*, 2010) and *Industrial Marketing Management* (only listed in Giunipero *et al.*, 2008). Table I shows the final list of selected journals, including their last impact factor (JCR 2016) and their ranking position in the management category. Figure 1 shows a graph of the impact factors of the selected journals compared to the whole category, showing that these have a median higher than the whole category (2.6 vs 1.7).

As only 7 of the 14 selected journals comprise information before 2008 in WOS, we study the following time span 2008-2016. In addition, as only one journal carries information as of 2009 onwards and another from 2010, we therefore, gathered manually from the web pages of those two journals, all the necessary data for the completion of the selected time span. Thus, a total of 5,755 articles were included (articles gathered manually represent less than 0.005 per cent of the total articles analyzed).

Table I also shows the number of papers published during the time span and the Latin American papers for the time span chosen. In this last category, all papers that have at least one author from a LATAM country affiliation are included considering the information available in WOS. Therefore, we excluded Latin American researchers affiliated to foreign countries, while non-Latin American researchers affiliated in LATAM are considered in the analysis. We selected such criterion to analyze solely the research executed by local researchers to identify further regional research directions for LATAM. Indeed, a total of 100 Latin American articles were acknowledged over the 2008-2016 time span.

2.2 Exploratory survey

We used the Survey Monkey® platform to construct the web survey, and ran it for a three-month period. We shared the link by e-mail with a presentation letter, to over 600 researchers and consultants from the region, whom were selected from Qs Ranking of top universities and professional databases. The survey was mainly answered in Spanish, although an English version was also available for those who requested it.

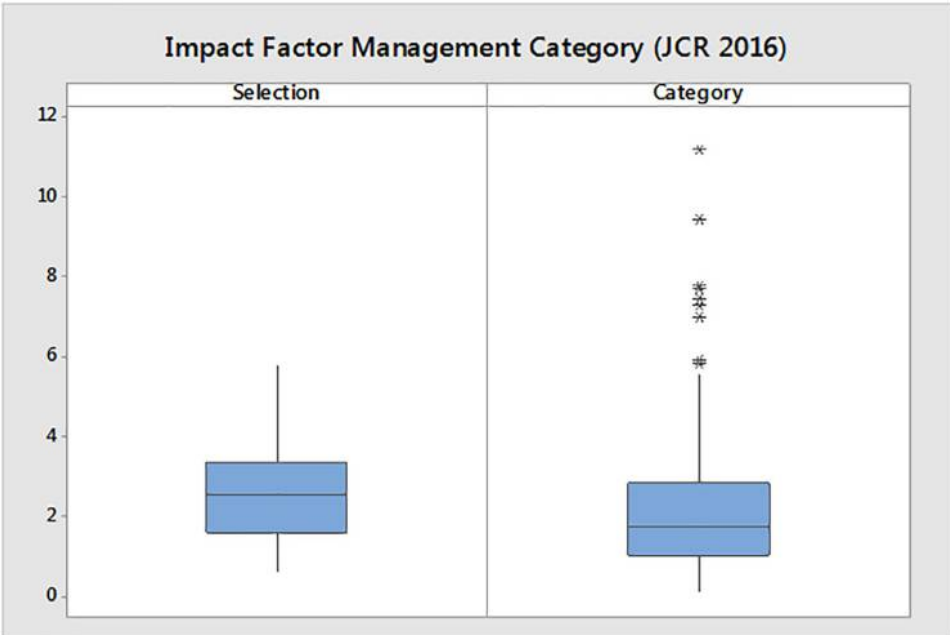
For the purpose of answering *RQ5* and *RQ6*, we designed a survey consisting of three sections. The first one aimed to characterize respondents. The second focuses on SCM difficulties, where respondents had to rate them out of 18 difficulties using a five-level Likert scale from 1 (strongly disagree) to 5 (strongly agree). The list of difficulties was gathered from Tanco *et al.* (2015), who created a list of SC related difficulties based upon the existing SC literature. Notice that, since the experience of the investigators influenced the method applied, we may consider the list and number of difficulties as subjective. However, we obtained similar results that previous studies from the literature. For example, a World Economic Forum report (World Economic Forum, 2016a) considers a core set of 29 global risks, while a PwC and MIT report (Strom *et al.*, 2013) presents a list of 14 greatest risks to which SCs are exposed. In this work, we consider a difficulty as any factor that significantly affects (or has affected in recent years) the performance of the SCs. This definition includes other expressions frequently used in the literature such as glitches, barriers, issues and problems. Difficulties exist at multiple levels of the SC: organizational, intra-organizational, inter-organizational levels (Hoole, 2005). The 18 difficulties (D) identified in this research are summarized below and are further explained in the aforementioned article:

1. *(D1)- Telecommunications infrastructure*: Some regions lack communications the technical infrastructure to allow firms efficient operations. For example, in many developing countries, the infrastructure of telecommunications limits firms' ability to exchange information via voice, fax or computer.
2. *(D2)- Local warehousing infrastructure*: Lack of necessary infrastructure, poor storage and warehousing processes are some of the difficulties dealt with in this category.

Table I Journals and articles included for the study

N	Journal	IF 2016	Rank IF 2016	SCM List™	Giunipero *et al.* (2008)	Menachof *et al.* (2009)	Defee *et al.* (2010)	Years included in ISI	Total Papers 2008-2016	LATAM 2008-2016
1	*Journal of Supply Chain Management*	5.79	9	X	X	X	X	2008-2016	191	3
2	*Journal of Operations Management*	5.21	11	X	X			1999-2016	341	3
3	*Supply Chain Management: An International Journal*	4.07	20			X		2003-2016	380	12
4	*International Journal of Operations & Production Management*	3.34	31		X	X		1994-2016	485	14
5	*Journal of Business Logistics*	2.88	47	X	X	X	X	2008-2016	207	5
6	*Management Science*	2.82	50	X	X	X		1954-2016	1398	15
7	*International Journal of Physical Distribution & Logistics Management*	2.56	60		X	X	X	2008-2016	352	6
8	*Operations Research*	1.78	93	X		X		1959-2016	947	17
9	*M&SOM-Manufacturing & Service Operations Management*	1.68	100	X				2006-2016	365	6
10	*International Journal of Logistics Management*	1.61	102		X	X	X	2008-2016	215	6
11	*Decision Sciences*	1.60	103	X	X	X		1984-2016	300	0
12	*International Journal of Logistics-Research and Applications*	1.02	149			X		2008-2016	249	8
13	*Operations Management Research*	0.80	162					2010-2016	99	1
14	*International Journal of Shipping and Transport Logistics*	0.61	176					2009-2016	226	4
	Total		**194**						**5755**	**100**

Figure 1 Impact factor comparison



3 *(D3)- Air transportation*: High-prices of air transportation, price variability because of major airlines revenue management, low frequency of cargo services, cargo security, growing cost of fuel and overall delivery time and capacity.

4 *(D4)- Maritime transportation*: Low service transit time, low availability of shipping lines, port infrastructure and variability in delivery time mainly caused by delays at terminals and port congestions, poor management of containers and inefficient cargo handling.

5 *(D5)- Ground transportation (by rail or road)*: High service price, low service availability or capacity, lead time variability, scheduling and routing problems, qualified drivers shortage, outdated tracks and locomotives, low-quality roads and railroads, and urban congestion.

6 *(D6)- Custom process and similar paperwork*: Problems with efficiency and effectiveness in paperwork required for several customs, administrative and legal processes.

7 *(D7) - Government policies*: Government policy changes affecting the business community, for difficulties arise when public and private interests fail to integrate.

8 *(D8)- Political environment*: Threats associated with potential or actual political system changes. The rationale behind separating political and policy difficulties lies in the observation that changes of government do not necessarily imply changes in government policies affecting business investment, nor does political stability preclude unchanged government policies.

9 *(D9)- Macroeconomic and Market instability*: Macroeconomic instability is a broad concept encompassing fluctuations in economic activity levels and prices. On the other hand, product market instability refers to unexpected demand changes for an industry output, which might be caused by changes in customer tastes or substitute products availability.

10 *(D10)- Workforce availability*: Difficulties related to availability of skilled or unskilled workforce, such as high employee turnover, lack of employees training programs, lack of employee skills, low unemployment rate and worker absenteeism.

11 *(D11)- Workforce productivity*: Changes in employee productivity, either at a firm-specific level or the industry in general, such as labor unrest, strikes, lack of employee involvement and commitment, work ethic and attitude of the workforce and organizational culture.

12 *(D12)- Supply-side problems*: Disruptions to the flow of product or information, emanating from within the network upstream of the focal firm. Shortage of raw materials, suppliers' financial stability, geographical distances from suppliers and excessive material lead-time are all examples of supply-side issues.

13 *(D13)- Distribution-side problems*: Disruptions to the flow of product, information and cash, emanating from within the network between the local firm and the market. Pressure by customers to reduce prices, cancelation of orders, defaults of clients on their debts, geographical distance and late deliveries are examples of distribution-side problems.

14 *(D14)- Systematic delays in their own production*: Machine breakdown, capacity limitation, outdated technology, rush orders, balancing inventory levels, frequent changeovers and accidents disturbing production processes are all examples that fall under this category.

15 *(D15)- Internal and external integration*: Lack of trust and sincerity among SC members, myopic view and lack of visibility are some of the external integration difficulties. Furthermore, internal relationships can be hard to

handle, since functional silos with different goals may coexist in the organization resulting in internal turf wars.

16 *(D16)- Knowledge and skills for managing the SC*: Lack of skilled individuals, poor understanding of SCM concept, lack of experience, lack of power and ability to drive and lead changes within the chain, among others obstacles.

17 *(D17)- Commitment of top management*: Lack of top management support, broad-based functional support and infrastructure/governance support correspond to this category.

18 *(D18)- Information technologies*: The absence of sophisticated IT for information sharing among SC members, lack of appropriate IT, lack of transparency of information in SC, incompatible IT at different levels of the SC, among others, are included herein.

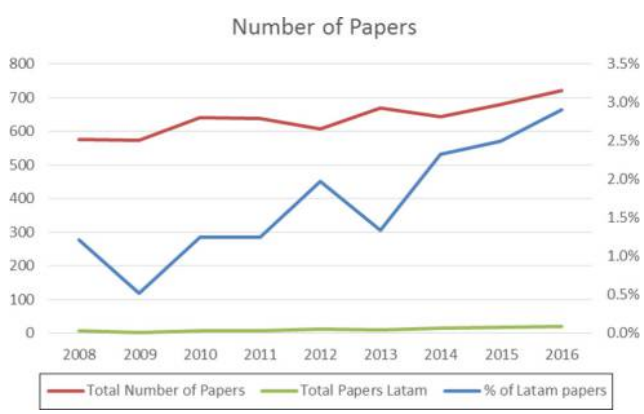
Finally, the third section of the survey included some questions to detect whether any difficulty was left behind, while also ascertaining the overall satisfaction of respondents with the questionnaire.

Results were analyzed using statistical tools. First, we used a one-way analysis of variance (ANOVA) to observe possible significant differences between the ratings of each difficulty. Next, we performed an exploratory factor analysis (FA) and ANOVA analysis to identify possible patterns among LATAM regions.

3. Contribution of Latin American researchers to the supply chain management body of knowledge

A total of 5,755 articles were published in the 14 selected journals during 2008-2016. From those, only 100 correspond to at least one Latin American author[1], which represents a 1.74 per cent contribution of LATAM to the total number of papers. Therefore, we conclude that the number of papers produced by Latin American researchers is not significant (in quantity) to the SCM body of knowledge (*RQ1*). Nonetheless, in spite of the slightly growing number of papers published by the journals selected during these years, Figure 1 shows that Latin American contributions seem to be growing at a higher rate, since the percentage of papers from LATAM has increased from 1.3 (2008-2013) to 2.6 per cent (2014-2016) (Figure 2).

Figure 2 Number of articles published during the 2008-2016 period in the selected journals



Moving further with the analysis, Table II presents the list of LATAM articles characterized according to the following criteria:

- *Country*: It includes LATAM country affiliation of the authors.
- *Cooperation*: It includes the affiliation of all other authors different from LATAM.
- *1st author*: It indicates that the first author of a paper corresponds to a Latin American affiliation.
- *Barrier:* It is based on the classification presented in the categories mentioned in Section 3.2, to ascertain the topic of the papers.
- *Methodology:* It classifies articles in five categories: Survey (S), Theoretical (T), Simulation (SIM), Case Study (CS) and others (O).
- *Focus:* It classifies articles into four categories according to the focus of the paper regarding LATAM: Articles specific to LATAM (SP); LATAM is just included in the focus of the paper (INCL); only uses Latin American data (LAT) or are not related to LATAM at all (No).

Authors from Brazil are the most prolific in LATAM (45 per cent), followed by authors from Chile (26 per cent). The other countries have a lower presence in publications: Colombia (9 per cent), Argentina (9 per cent), Mexico (5 per cent), Costa Rica (3 per cent), Uruguay (1 per cent), Honduras (1 per cent), Ecuador (1 per cent) and Guatemala (1 per cent)[2]. In addition, while most works are of multiple authorship, with an average of 3.05 authors per paper, in 59 per cent of the articles the lead author has a Latin American affiliation. Furthermore, when analyzing collaboration among paper authors, most of it happens between American (the US) affiliation authors (45 per cent), followed by a cooperation of authors affiliated to Brazil (13 per cent), England (7 per cent), Spain (5 per cent), Portugal (5 per cent), The Netherlands (5 per cent) and China (5 per cent). Surprisingly, there is no article showing collaboration between authors from two different Latin American countries, nor in collaboration with companies.

Finally, after analyzing the affiliation of Latin American authors, we ascertained that 93 per cent of the works where published with a university affiliation. Universities with more than five publications are: Universidade de São Paulo (7), Universidade Federal do Rio de Janeiro (7) and Universidade Federal de São Carlos (6). Figure 3 shows the number of articles published from universities which are part of the Qs University Rankings Latin America 2018™. We notice that almost 70 per cent of the papers were published by top 40 universities according to such ranking.

To analyze the quality of the papers published, we focused on two aspects: quality of the journal and number of citations received. Considering the percentage of papers published in top journals (Q1[3] of JCR, Management Category, WOS) LATAM's contribution represents 2.31 per cent. Notwithstanding, if we only take into consideration the top three journals from the aforementioned selection, the contribution is 1.97 per cent, both results being slightly higher than the general LATAM contribution of 1.74 per cent. On this base, we conclude that Latin American authors have a standard productivity in top journals (*RQ2*).

Table II Details of latin American papers published in selected journals during 2008-2016

Paper	Country	Cooperation	1stA	Barrier	Meth.	Focus
Lambert *et al.* (2008)	Argentina	The USA	No	17	T	NO
Miranda Bront *et al.* (2009)	Argentina	The USA	Yes	13	T	NO
Chaneton and Vulcano (2011)	Argentina	The USA	Yes	9	SIM	NO
Wilmsmeier *et al.* (2011)	Argentina	Scotland/ Spain	No	4	CS	SP
Kolova and Stier-Moses (2014)	Argentina	The USA	No	5	T	NO
Enz and Lambert (2015)	Argentina	The USA	Yes	15	CS	NO
Lambert and Enz (2015)	Argentina	The USA	No	17	T	NO
Lodi *et al.* (2016)	Argentina	Italy/The USA	No	–	T	NO
Hyndman *et al.* (2013)	Argentina/ Costa Rica	The Netherlands/ The USA	No	13,15	T	NO
Amaral (2008)	Brazil	–	Yes	14	T	NO
Duarte Canever *et al.* (2008)	Brazil	The Netherlands	Yes	13	CS	SP
McCormack *et al.* (2008)	Brazil	The USA	No	16-17	S	SP
Pires and Sacomano Neto (2008)	Brazil	–	Yes	15	CS	SP
Guerreiro *et al.* (2008)	Brazil	–	Yes	13	CS	LAT
Vieira *et al.* (2009)	Brazil	Brazil	Yes	15	S	SP
Scavarda *et al.* (2010)	Brazil	England	Yes	9,13	CS	INC
Mendes (2010)	Brazil	–	Yes	12,15	CS	NO
Kusaba *et al.* (2011)	Brazil	Germany	No	12, 16	T	INC
Wanke (2011)	Brazil	–	Yes	4	SIM	LAT
Domingues Zucchi *et al.* (2011)	Brazil	The USA	Yes	2	CS	LAT
Rogers *et al.* (2012)	Brazil	The USA	Yes	13	T	NO
Bartolacci *et al.* (2012)	Brazil	US/Austria	No	16	T	NO
Costa Santos *et al.* (2012)	Brazil	Brazil	Yes	16	T	NO
Godinho (2012)	Brazil	–	Yes	14	CS	LAT
Größler *et al.* (2013)	Brazil	The Netherlands/ Norway/Brazil	No	15-16	S	INC
Philpott *et al.* (2013)	Brazil	New Zealand	No	–	T	NO
Shapiro *et al.* (2013)	Brazil	The USA/England	No	–	T	SP
Vivaldini and Pires (2013)	Brazil	–	Yes	5	CS	LAT
Roberta Pereira *et al.* (2014)	Brazil	England	Yes	12,15	T	NO
Della Bruna *et al.* (2014)	Brazil	Brazil	Yes	16	CS	LAT
Wanke (2014)	Brazil	–	Yes	5	CS	SP
Miguel *et al.* (2014)	Brazil	Brazil	Yes	15	S	LAT
Beheregarai Finger *et al.* (2014)	Brazil	Brazil/The USA	Yes	18	S	No
Chipulu *et al.* (2014)	Brazil	The UK/South Africa/UAE/ China/Greece	No	11	S	LAT
Monteiro de Carvalho (2014)	Brazil	–	Yes	18	CS	LAT
Alam *et al.* (2014)	Brazil	US/ Korea/India	No	15	S	LAT
Frías *et al.* (2014)	Brazil	Brazil/US	Yes	7	CS	LAT
Gambi *et al.* (2015)	Brazil	Brazil/ Denmark	Yes	11,16	S	LAT
Piechnicki *et al.* (2015)	Brazil	Brazil	Yes	11,14	CS	LAT
Chen *et al.* (2015)	Brazil	Brazil	Yes	16	S	LAT
Alves *et al.* (2015)	Brazil	–	Yes	14	O	SP
Wanke *et al.* (2015)	Brazil	The USA	Yes	5	SIM	SP
Corso and Wallace (2015)	Brazil	Australia	Yes	5	S	NO
Ferreira *et al.* (2015)	Brazil	Brazil	Yes	16	T	NO
Benassi *et al.* (2016)	Brazil	–	Yes	18	T	NO
Caldieraro (2016)	Brazil	–	Yes	13	T	NO
Campos and Vázquez-Brust (2016)	Brazil	England	Yes	14-16	CS	SP
Ferman (2016)	Brazil	–	Yes	13	T	NO
Kysucky and Norden (2016)	Brazil	China	No	–	T	INC
Marchesini and Alcântara (2016)	Brazil	Brazil	Yes	16	CS	SP

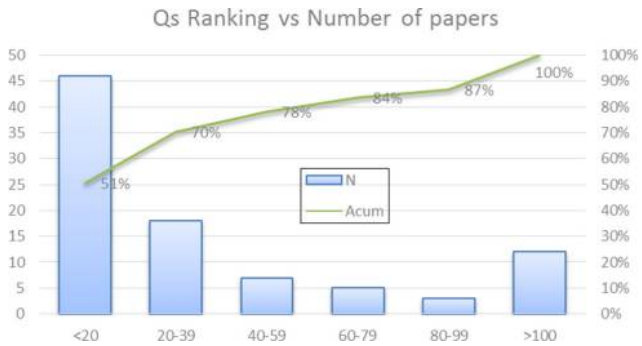
(*continued*)

Table II

Paper	Country	Cooperation	1stA	Barrier	Meth.	Focus
Marodin *et al.* (2016)	Brazil	Brazil/The USA	No	14-15	S	SP
Pimenta *et al.* (2016)	Brazil	Brazil/The USA	Yes	15	CS	SP
Thome and Sousa (2016)	Brazil	Portugal	Yes	14	T	NO
Wanke and Barros (2016)	Brazil	Portugal	Yes	4	CS	SP
Cominetti *et al.* (2009)	Chile	The USA	Yes	4	T	NO
Cominetti *et al.* (2010)	Chile	Switzerland	Yes	13	T	NO
Koenisgsberg *et al.* (2010)	Chile	The USA	No	14	T	NO
Lee *et al.* (2010)	Chile	The USA	No	–	T	NO
Casadesus-Masanel and Llanes (2011)	Chile	The USA	No	–	T	NO
Kardes *et al.* (2011)	Chile	The USA	No	–	T	NO
Chicoisne *et al.* (2012)	Chile	Chile	Yes	12	T	NO
Epstein *et al.* (2012)	Chile	The USA	Yes	12	CS	SP
Olivares *et al.* (2012)	Chile	The USA	No	12	T	SP
Carvajal *et al.* (2013)	Chile	The USA/Portugal	Si	12	T	NO
Kong *et al.* (2013)	Chile	China/Singapore	Yes	13	T	NO
Lu *et al.* (2013)	Chile	The USA	No	13	CS	NO
Mingo (2013)	Chile	–	Yes	15	CS	SP
Yu *et al.* (2014)	Chile	England/China/Spain	No	15	S	NO
Bruccoleri *et al.* (2014)	Chile	Italy	No	11	SIM	NO
Besbes and Sauré (2014)	Chile	The USA	No	9	CS	LAT
Kim *et al.* (2014)	Chile	The USA	No	12	T	SP
Cheyre *et al.* (2015)	Chile	The USA/Portugal	Yes	14	T	NO
Cooper *et al.* (2015)	Chile	The USA	No	13	T	NO
Kim *et al.* (2015)	Chile	The USA	No	13	DA	NO
Khademi *et al.* (2015)	Chile	The USA	No	13	SIM	NO
Schwarze and Voß (2015)	Chile	Germany	No	4	SIM	NO
Brahm and Tarziján (2016)	Chile	England	No	12;15	T	NO
Cominetti *et al.* (2015)	Chile	–	Yes	–	T	NO
Correa *et al.* (2016)	Chile	The USA	Yes	13	T	NO
Hoeksma and Uetz (2016)	Chile	The Netherlands	Yes	13	T	NO
Levi *et al.* (2008)	Colombia	The USA	No	14	T	NO
Hernández-Espallardo *et al.* (2010)	Colombia	Spain	No	15,17	S	LAT
Elmaghraby *et al.* (2012)	Colombia	The USA	No	12	T	NO
Cardona *et al.* (2012)	Colombia	Colombia	Yes	2	SIM	NO
Ke *et al.* (2015)	Colombia	The USA	No	3,4,5	T	NO
Jola-Sánchez *et al.* (2016)	Colombia	The USA	No	8	I	SP
Holguín-Veras *et al.* (2016)	Colombia	The USA/France	No	9	T	NO
Steven and Britto (2016)	Colombia	The USA	No	12	CS	NO
Vivares-Vergara *et al.* (2016)	Colombia	–	Yes	11	S	SP
Ruben and Zuniga (2011)	Costa Rica	The Netherlands	No	6,9,15	CS	SP
Retana *et al.* (2016)	Costa Rica	The USA	Yes	13	CS	NO
Rodriguez *et al.* (2016)	Ecuador	Spain/Ireland	Yes	12;15	CS	SP
McGinnis *et al.* (2012)	Guatemala	The USA	No	17	S	SP
Ortega *et al.* (2012)	Honduras	Spain	Yes	17,18	T	NO
García Reyes and Giachetti (2010)	Mexico	The USA	Yes	1-18	O	SP
Horta *et al.* (2010)	Mexico	The USA/Portugal	No	–	DA	SP
McWilliams (2012)	Mexico	–	Yes	13	T	SP
Monsreal and Cruz-Mejia (2014)	Mexico	–	Yes	13	SIM	NO
Kalasnikov *et al.* (2016)	Mexico	Russia	Yes	5	T	NO
Tanco *et al.* (2015)	Uruguay	–	Yes	1-18	S	SP

In addition, when considering the number of citations received as a measure of quality, there is a significant difference between LATAM and the whole body of knowledge (*RQ3*). All papers together have an average citation per paper of 18.9 (2.1 cites per year), while Latin American papers receive 10.45 citations per paper (1.2 cites per year). Considering the *h*-index [4], LATAM has an *h*-index of 18 whereas all articles jointly have an *h*-index of 105. This can also be appreciated by

Figure 3 Relationship between Qs LATAM ranking and the number of papers



analyzing the top 500 articles (in regards to amount of citations), where only three articles (Hernández-Espallardo *et al.*, 2010; McCormack *et al.*, 2008; Ruben and Zuniga, 2011) are from LATAM, representing 0.06 per cent.

As for the content of the articles regarding their methodology, we classify them as follows: theoretical (44 per cent), case study (24 per cent), surveys (18 per cent), simulation (9 per cent) and other (5 per cent). Moreover, analyzing their scopes, we observe that only 27 per cent of them are specific to the Latin American context, while 20 per cent include Latin American data as examples of developing countries. In particular, Latin American articles do not only represent a low number of publications (compared to the totality of articles analyzed) but also 53 per cent of them are not related to Latin American issues, nor use Latin American data. Besides, almost half of the articles focus on issues strictly related to SCM such as integration, top management commitment and managerial skills to manage the SC.

Finally, we compared our findings to the number of papers published by Latin American researchers in another field, such as the Operations Research and Management Science Category on WOS, which has historical roots on logistics and SC. We chose the following 14 journals for the same time span to make the analysis comparable:

1 *European Journal of Operational Research*;
2 *International Journal of Production Research;*
3 *International Journal of Production Economics;*
4 *Annals of Operation Research;*
5 *Operations Research Letters;*
6 *Production and Operations Management;*
7 *Transportation Research Part B;*
8 *Transportation Science;*
9 *Transportation Research Parte E;*
10 *Production Planning & Control;*
11 *International Transactions in Operational Research;*
12 *IIE Transactions;*
13 *Computers & Operations Research;* and
14 *Journal of the Operational Research Society*.

This sample of journals published 22,988 articles during 2008-2016, four times as many articles as the management category previously analyzed. From this sample, 1,169 articles were published by Latin American researchers, which represents 5.1 per cent of total publications. These papers received an average citation of 10.7, has an *h*-index of 43, and has ten articles (2 per cent) on the list of the top 500 most cited papers from this sample. Comparing the results from both categories, Latin American researchers seem to have a more prolific output in the Operational Research and Management Science category. Nevertheless, the share of number of publications and the quality of the research are just slightly better than in the Management category (*RQ4*).

4. Main difficulties hindering supply chains in Latin America

4.1 Survey characterization

A total of 106 questionnaires were received, leading to an initial response rate of 20.5 per cent. As some questionnaires were not complete, we only considered 93 responses, which leads to a survey-wide sample error of less than 9.2 per cent[5]. The largest number of survey respondents were professors and lecturers (72 per cent), followed by researchers (48 per cent), consultants (37 per cent) and employees of the companies (16 per cent)[6]. Moreover, the majority of the people who answered the survey came from Brazil (26 per cent), Colombia (17 per cent), Mexico (16 per cent), Argentina (11 per cent), Uruguay (10 per cent) and Peru (5 per cent). Only a small proportion of the respondents claimed to have published previously in the SC area on JCR journals (25 per cent) and, on average, the respondents had 10 years of experience in the field. Table III shows further details on the sample characterization.

Although the survey guaranteed anonymity, respondents were offered to include an email address to receive an executive summary of the survey results, and therefore 79 e-mails where registered. From those e-mails, and only considering professors

Table III Characterization of the sample

Country	N	Experience (years)	Professor/ Lecturer (%)	Researcher (%)	Consultant (%)	Employed at companies (%)	Have Published in ISI Thomson (past 10 years) (%)
Argentina	10	15	60	10	60	30	10
Brazil	24	11	88	54	13	4	13
Colombia	16	9	69	81	44	13	44
Mexico	15	12	53	53	60	13	33
Peru	5	10	40	30	20	60	0
Uruguay	9	15	64	11	69	11	0
Other	14	7	93	50	14	21	50
Average		10	72	48	37	16	25

and researchers whom where the majority, we could identify 63 academics. These intellectuals show a comparable university quality affiliation to the bibliometric analysis, considering the Qs University Rankings Latin America 2018™. However, responses to the survey include more representatively on LATAM, which explains the differences. Therefore, the similarities between the sample of the two methods enables comparing the results and responding to *RQ7* (Figure 4).

4.2 Survey results

Respondents were asked to rate the impact each difficulty (D) had over the SC performance, using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Figure 2 presents the average results for each difficulty.

We used a one-way ANOVA to identify whether the ratings given to each difficulty were significantly different from each other. The analysis carried out allowed us to divide difficulties into three main groups displayed in different colors in Figure 2. According to the survey, the main concerns are "Custom process and similar paperwork" (D6), "Government policies" (D7) and "Ground Transportation" (D5) (Figure 5).

Once difficulties were ranked, we decided to narrow them down into fewer groups using full components exploratory analysis, a kind of FA. FA is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors. For example, it is possible that variations in five observed variables mainly reflect the variations in two unobserved (underlying) variables. FA searches for such joint variations in response to unobserved latent variables (Hair *et al.*, 2009). We modeled the observed variables as linear combinations of the potential factors, plus "error" terms. The information gained about the interdependencies between the observed variables can be later used to reduce the set of variables in a dataset.

We used the principal component analysis with Varimax and Kaizer normalization as the rotation method, implemented through SPSS software. The analysis is valid given that 68 per cent of the total variation was explained. Table IV shows the resulting components matrix for the analysis.

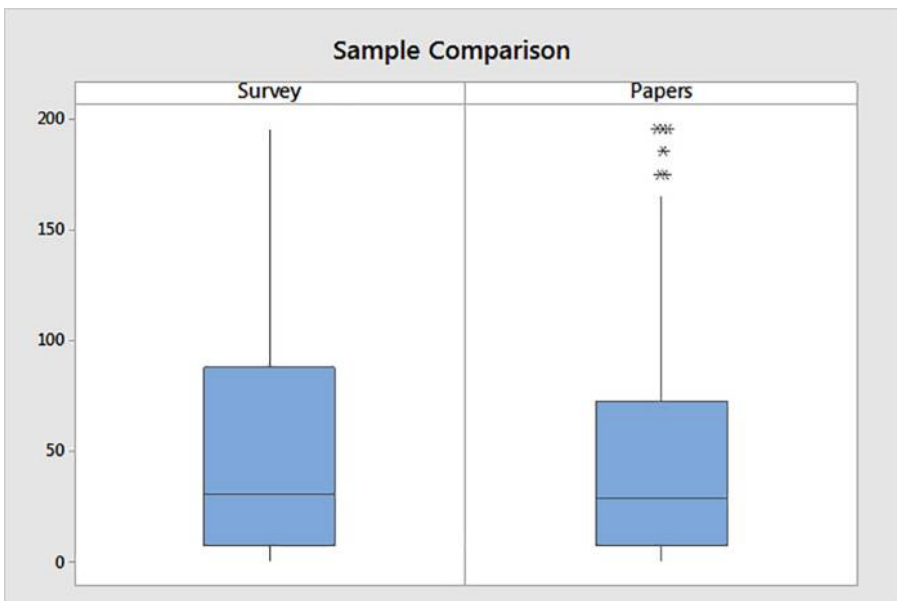
The analysis results show that barriers can be classified into five groups:

1. *SCM* involves difficulties related to the management of the SC, and the SC materials flow, such as lack of knowledge and top management commitment.
2. *Political conditions* imply difficulties generated in the SC environment related to political issues such as policy, political and custom processes.
3. *Infrastructure* implicates difficulties affecting the correct transit and movement of either materials or information along the SC. This group includes several modes of transportation and warehousing infrastructure.
4. *Workforce* considers all labor-related difficulties.
5. *IT and Market instability* are generated by telecommunications infrastructure, lack of integration in the SC and the instability of the Market.

Except for some slight differences, these five groups are similar to the ones obtained in the FA presented in Tanco *et al.* (2015).

We used an ANOVA to ascertain distinctions between average scores among the five groups. Only substantial differences are shown in this article. Table V shows the ANOVA for the groups which reveals that significant differences can only be supported by the Political Factor group

Figure 4 Sample comparison, considering only Qs ranking < 200



Notes: The sample excluded for the bibliometric profile was 13 per cent, while in the survey profile was 17 per cent

Figure 5 General Rating of Latin American SC difficulties

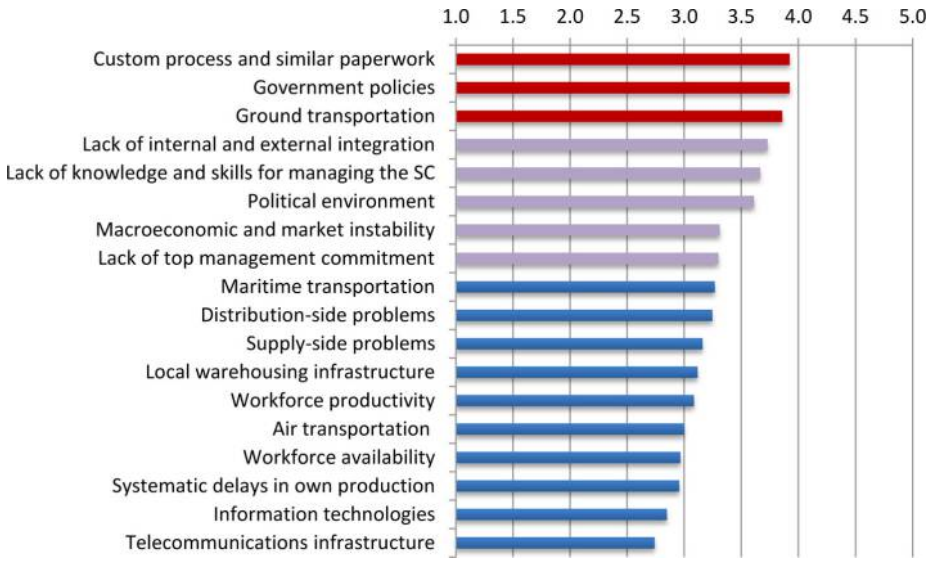


Table IV Components matrix

	Component				
Difficulties	**1**	**2**	**3**	**4**	**5**
Telecommunications infrastructure	0.499	0.095	0.154	−0.175	0.636
Local warehousing infrastructure	0.491	−0.203	0.380	−0.200	0.154
Air transportation	0.531	−0.006	0.513	−0.148	0.163
Maritime transportation	0.441	0.352	0.509	−0.233	0.031
Ground transportation	0.594	0.144	0.391	−0.293	−0.221
Custom process and similar paperwork	0.399	0.695	0.010	0.135	−0.336
Government policies	0.461	0.740	−0.039	0.148	−0.186
Political environment	0.363	0.607	−0.291	0.242	−0.002
Macroeconomic and market instability	0.434	0.376	−0.208	0.372	0.482
Workforce availability	0.537	−0.398	0.190	0.620	−0.006
Workforce productivity	0.493	−0.474	0.356	0.516	−0.073
Supply-side problems	0.713	−0.135	0.009	0.208	−0.105
Distribution-side problems	0.751	−0.124	0.076	−0.162	−0.234
Systematic delays in own production	0.516	−0.333	−0.275	−0.091	−0.044
Lack of internal and external integration	0.512	−0.203	−0.219	−0.210	−0.516
Lack of knowledge and skills for managing the SC	0.603	−0.270	−0.496	0.004	−0.011
Lack of top management commitment	0.629	−0.230	−0.491	−0.214	0.135
Information technologies	0.649	0.051	−0.405	−0.244	0.226

Note: Extraction Method: Principal Component Analysis, a. 5 components extracted

(p-value = 0.000), Infrastructure Factor (p-value = 0.005) and Workforce Factor (p-value = 0.01).

The post hoc Tukey test highlights significant differences (5 per cent significance level) between some countries which are displayed in four graphs hereunder (Figure 6). By computing the average score each country obtained concerning the factors, we created graphs to visualize countries relative positioning according to the interviewees perception of factors. We also analyzed other characterization variables, albeit without a relevant outcome.

Finally, in Figure 7, we compared the results from Uruguayan researchers [gathered through the survey explained in this paper with the ones obtained by Tanco *et al.* (2015)], through a previous survey among 130 Uruguayan managers. Results seem to reveal mismatched perceptions about the Uruguayan SC between company managers and researchers, partially supporting a misalignment between theory and practice in Latin American countries.

5. Discussion

The aim of this paper was first to review Latin American contribution to the research field of SCM. Despite the increasing interest from the management community in LATAM (Nicholls-Nixon *et al.*, 2011), the bibliometric analysis indicates that articles published by Latin American

Table V ANOVA Results

Difficulties	SS	df	MSS	*F*	Sig.
SCM					
Inter-grupos	7,186	6	1,198	1,214	0.307
Intra-grupos	84,814	86	0.986		
Total	92,000	92			
Political conditions					
Inter-grupos	27,830	6	4,638	6,216	0.000
Intra-grupos	64,170	86	0.746		
Total	92,000	92			
Infrastructure					
Inter-grupos	17,356	6	2,893	3,333	0.005
Intra-grupos	74,644	86	0.868		
Total	92,000	92			
Workforce					
Inter-grupos	16,051	6	2,675	3,029	0.010
Intra-grupos	75,949	86	0.883		
Total	92,000	92			
IT and market instability					
Inter-grupos	3,401	6	0.567	0.550	0.769
Intra-grupos	88,599	86	1,030		
Total	92,000	92			

authors are still scarce, constituting only 1.74 per cent of the totality of articles within the selected journals. This result is significantly lower than the World share of scientific publications of LATAM of 5.1 per cent, as shown by Unesco (2015). The exclusion of Latin American researchers not affiliated to LATAM universities[7] and the special selection of journals which strictly appear under the management category, imply some limitations of the study.

In addition, our results demonstrate that the quality and impact of Latin American authored papers are lower than average, specifically in respect of journals quality and number of citations received. This result is consistent with what González-Brambila *et al.* (2016) state about Latin American research in business having very low impact.

The low impact and number of papers from the region can be explained by at least five main reasons. First, as discussed by Da Silva *et al.* (2015), most Latin American authors publish in local journals. Second, Latin American regional investment in R&D is comparatively low and largely dependent on public funds (González-Brambila *et al.*, 2016). Nonetheless, a positive relationship in developing countries between R&D and economic growth is evidenced in recent studies (Inekwe, 2015). Third, addressing Unesco (2015) estimations, the number of researchers in the region is low and just accounts for around 3.6 per cent of the totality of researchers in the world. With the exception of Brazil, no country of LATAM has an R&D intensity comparable to that of dynamic emerging market economies. To narrow this gap, Unesco (2015) report concludes that countries need to start by increasing the number of researchers. Fourth, there is a low percentage of LATAM universities included in world rankings (just 4.0 per cent of top 500 according to Qs World University Rankings 2018, 2 per cent according to Academic Ranking of World Universities and 0.4 per cent according to THE World University Ranking). Finally, the analysis highlighted an absence of collaboration among the region, which could also explain the low publishing productivity (Lee and Bozeman, 2005; Batres-Pérez *et al.*, 2012).

By means of an exploratory survey, this paper also aimed to ascertain first-hand information from Latin American researchers on the main difficulties which they regard as having greater adverse impact on LATAM SCs. Given the current global competitiveness, identifying the difficulties, which hinder the performance of SCs, is a strong motivator for SC managers and researchers to better develop strategies and solutions to cope with uncertainty and allow businesses goal achievement (Giunipero *et al.*, 2008). Main results of the survey show that the key concerns in LATAM are "Custom process and similar paperwork" (D6), "Government policies" (D7) and "Ground Transportation" (D5). These results reflect the same issues raised by the Logistic Performance Index (LPI) for LATAM, lower scores being customs and infrastructure. Similar findings emerged from reports and magazines such as Branco *et al.* (2014) and Cedillo (2015), in which authors stated that LATAM faces important challenges in terms of lack of logistics infrastructure, trade facilitation agility (including customs procedures) and local transportation cost being significant, relying heavily in road transportation. Results are also aligned with some of the main SC challenges acknowledged by Carneiro and Brenes (2014) and Ruiz-Torres *et al.* (2012) who were already mentioned in the literature section.

The FA enabled to group the difficulties into fewer groups, namely, SCM, Political conditions, Workforce, Infrastructure, IT and Market instability. Major differences arise between Latin American countries when considering political conditions, their workforce situation and infrastructure problems. In particular, results show important differences regarding countries' political conditions, whose changes negatively impact the SCs. Moreover, some infrastructure disparities were also observed, although there is a general important regional deficit according the last Global Competitiveness Report (World Economic Forum, 2016b). Finally, we found relevant differences in workforce issues throughout LATAM, as diverse conditions (unions, salaries, regulations, education level, etc.) coexist.

Despite such challenges and as results suggest, LATAM is a promising market that merits time, attention and investment (Branco *et al.*, 2014). Besides the aforementioned differences, results emphasize the importance of gathering information on the challenges each region faces to search for SC solutions for the region in question.

6. Proposed future research direction

Further studies are needed to understand and develop specific solutions for LATAM to tackle regional barriers and increase the low productivity in the region. Therefore, future regional research directions are presented aiming to align the limited Latin American investigations resources to the real SC needs. We suggest that SCM research efforts should focus on five main areas: SCM for small firms, use of data-driven and emerging technologies to reduce bureaucracy and customs paperwork, establishment of priorities for investment in

Figure 6 Differences between groups and countries

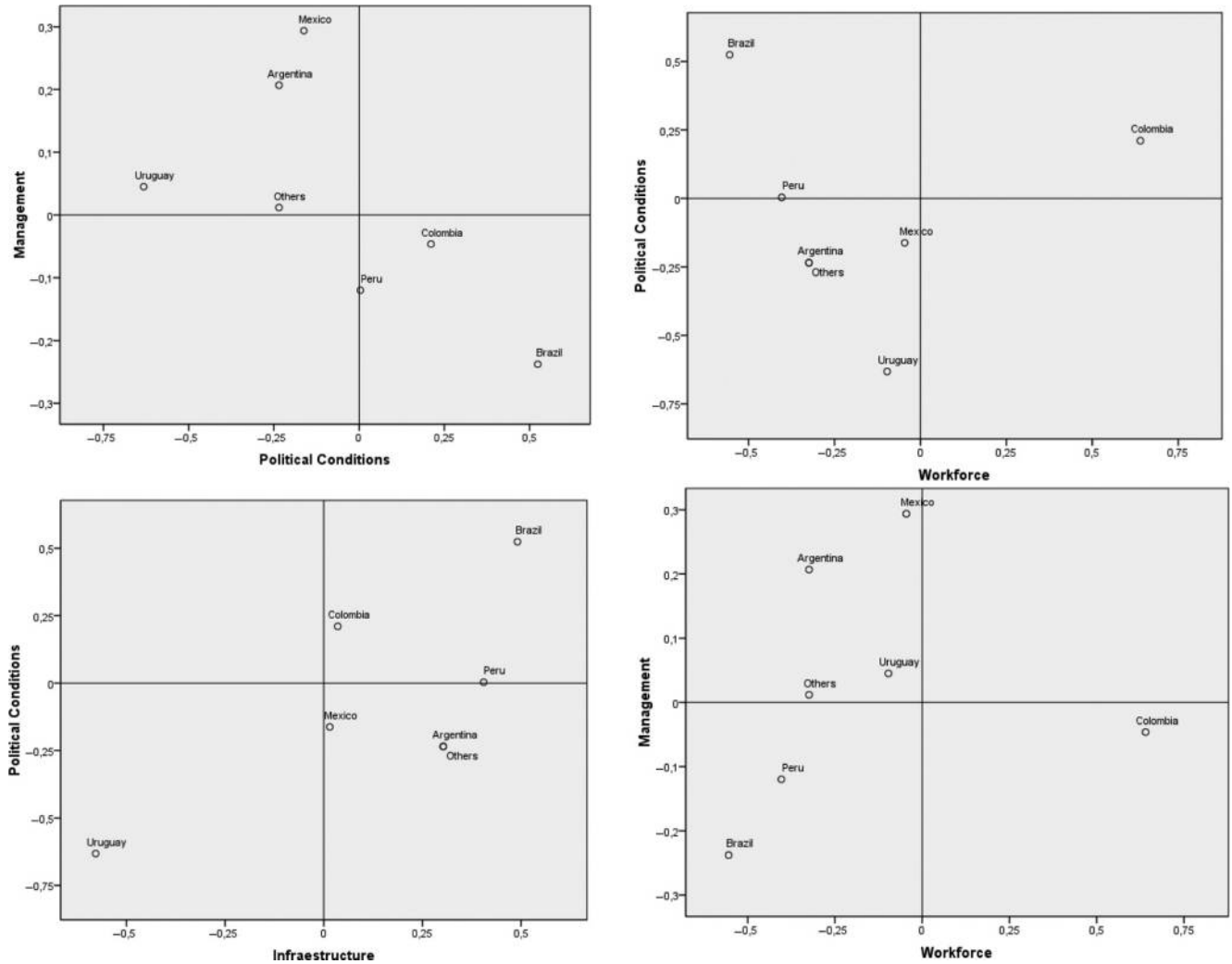
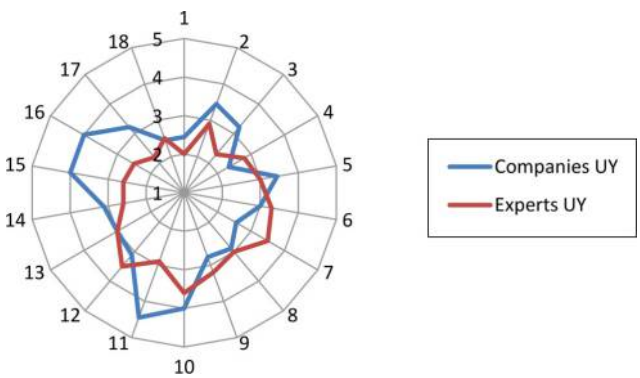


Figure 7 Uruguay SC difficulties comparison



logistics infrastructure, implementation of innovative solutions for urban logistics and last mile operation and finally strengthening human capital and needed skills over SC in LATAM.

Although the heterogeneity of countries in LATAM does not allow a uniform approach, the region as a whole would reap the benefits from policies to drive productivity and potential growth onwards (OECD/ECLAC/CAF, 2016). As most of the emerging-market economies, LATAM needs to raise productivity growth to narrow the large gap in living standards in comparison to advanced economies and to escape the middle-income trap. Official statistics suggest that, on average, Latin Americans spend more time in work activities than the OECD average, but that this comparatively high contribution of labor resource utilization to GDP per capita is more than offset by the huge gap in productivity levels (OECD, 2016). The main source of the lack of productivity is explained by the poor performance of small firms. Future work should focus in providing case studies, applied research and frameworks to help LATAM firms, mainly small and micro, reducing the gap with respect to the productivity "Efficient" frontier.

Second, the region should work strongly to reduce general bureaucracy and customs paperwork in particular, to improve international trade relations. LATAM should have a special focus on the relations with Asia, and particularly China.

China's contribution to world growth is expected to reach 30 per cent for 2016-21, in contrast to the 5 per cent contribution of LATAM. Trade ties between LATAM and China have soared, the latter becoming the largest trading partner for Brazil, Chile and Peru. Financial ties have also increased: Chinese lending to LATAM has become the most important source of external financing (US$125bn between 2005 and 2015), surpassing other international financial institutions in the region (OECD, 2016). Therefore, there is an increasing opportunity to introduce pilot studies of data-driven and emerging technologies in SCM to ease the international trade relations, while decreasing customs paperwork and delays.

Third, the region needs to improve logistics infrastructure as remarked by the persistent low results published by the World Bank through the LPI and the Global Competitiveness report of the World Economic Forum. First, regional infrastructure performance varies both across countries and sectors. On average, infrastructure investments in LATAM are little, but this average is driven by some of its largest countries, Argentina, Brazil and Mexico, while many others invest more than 4 per cent of their GDP a year (World Bank, 2017). A recent World Bank (2017) report concluded that LATAM can dramatically narrow its infrastructure service gap by spending efficiently on the right objectives. Researchers need to help governments define priorities to better invest, promoting a better public–private decision-making through intelligent resource allocation and sustainable infrastructure.

Fourth, LATAM needs to improve the freight road transportation system. Because of the lack of railroads, most of the freight is transported by trucks, which tend to be old and have to drive on poorly maintained highways. Moreover, according to UN, LATAM is the second-most urbanized region in the world and has the highest urban population growth in the past few decades. Hence, research focus should also be on urban logistics and last mile operations efficiency. Latin American cities are significantly different from those of US or Europe considering the profile of consumers (i.e. more low-income), number of retailers (more presence of nanostores) and the public–private environment (i.e. informality and regulations) (Fransoo *et al.*, 2017). This means solutions to be adopted for LATAM should be different.

Finally, the strengthening of human capital and skills may be realized by the introduction of changes at all education levels in LATAM. Alaimo *et al.* (2015) argue that the region seems trapped in a "vicious cycle" in which high turnover discourages education and training of workers and this results in low productivity. In turn, low labor productivity, relative to the costs of formality, including taxes and social security contributions, leads to a high level of informality. Owing to high turnover and informality, most workers lack support to withstand a period of unemployment while looking for a good job suited to their skills and training, leading to inefficient job matches. And these, again, tend to break up quickly, generating high turnover and completing the vicious cycle.

To overcome the issues raised herein, more regional collaboration is needed. A cutting edge approach to tackle the lack of collaboration is the MIT Global Scale Network[8], an international alliance of leading research and education centers dedicated to the development and dissemination of global innovation in SC and logistics. In particular, the Center for Latin America Innovation, located at Colombia, has a network of 27 top affiliated universities partners and has fostered collaboration and joint research among them. This article results from such collaboration and shows how a stronger relationship among LATAM SC researchers is possible and that greater regional investigation is worth the effort.

7. Conclusion

LATAM offers companies a different kind of emerging market with faster growth than most mature economies and a wealthier starting point than much of Asia. Unlocking this potential, however, requires strategies to tackle the difficulties that arise in this region. Unfortunately, this article exposes the lack of research in the field of SC in Latin America, both in terms of quality and quantity. Therefore, LATAM needs to foster and promote local research as a region with high impact over every country to help firms overcome geographical and political complexities and contribute to the whole SC body of knowledge.

SC challenges in LATAM are numerous and complicated. Despite more than 20 years of academic study, there is a significant gap between SC theory and practice and many researchers report that only few companies engage in extensive SCM practices (Chicksand *et al.*, 2012; Halldorsson *et al.*, 2008). In addition, González-Brambila *et al.* (2016) presented empirical evidence that suggests a disconnection in the region between those who produce knowledge (academia) and those who use it (business practitioners). Therefore, our article demonstrates the necessity of continuous development and extension of the SCM body of knowledge in LATAM and serves as a foundation for future research efforts in the region.

Notes

1. In this last category, all papers that had at least one author from a LATAM country affiliation were included considering the information available in WOS.
2. Hyndman *et al.* (2013) has one author with double affiliation from LATAM: Argentina and Costa Rica.
3. *Q1*. Refers to journals ranked in first quartile within their category based on their JCR impact factor.
4. Measure of productivity and citation impact of publications. An index of h means that h papers each of which has been cited in other papers at least h times.
5. With $p = q = 0.5$ and a significant level of 95 per cent.
6. Multiple responses were feasible. Results confirm that is very common in Latin America for professor to have other professional activities.
7. Latin America and the Caribbean were the fastest growing regions of origin for international students in the USA (Institute of International Education, 2015).
8. http://scale.mit.edu/

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