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Beyond global nodes and economic indicators in the evaluation of the world-system of cities

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Abstract

The paper aims to look at the organisation of the world-urban system. It proposes an integrated explorative approach which, in addition to considering economic-production type indicators, includes others that can reflect a complex approach to functional and geographic specialisation. Methodologically, the comparative analysis of three synthetic indices through a cluster analysis allows for the multifunctional representation of the world-urban system, in which other centralities and cities excluded from other rankings are considered. The first index is taken from the proposal by the GaWC (Global and World Cities Research Network). The second relates to cultural services and some of the knowledge-intensive activities. The third includes variables related to mobility, more specifically air transport. The comparison of functions, as revealed by the indices, can provide information about how cities work in the world context. The analysis allows for the identification of a group of prominent multifunctional cities at the top, and a large group of less prominent and specialised cities underneath.

Zusammenfassung

Der Beitrag untersucht die Organisation des Weltstadt-Systems. Vorgeschlagen wird ein integrierter explorativer Ansatz, der neben der Berücksichtigung von Indikatoren für die Art der wirtschaftlichen Produktion auch andere umfasst, die einen komplexen Ansatz der funktionalen und geographischen Spezialisierung widerspiegeln können. Methodisch ermöglicht die vergleichende Analyse von drei synthetischen Indizes durch eine Clusteranalyse die multifunktionale Darstellung des Weltstadt-Systems, in der zentrale Funktionen und Städte, die in anderen Ranglisten ausgeschlossen sind, berücksichtigt werden. Der erste Index ist dem Vorschlag des GaWC (Global and World Cities Research Network) entnommen. Der zweite bezieht sich auf kulturelle Dienstleistungen und einige wissensintensiven Aktivitäten. Der dritte enthält Variablen, die mit der Mobilität, insbesondere dem Luftverkehr, zusammenhängen. Der Funktionsvergleich, wie er sich aus den Indizes ergibt, kann Informationen darüber liefern, wie Städte im weltweiten Kontext funktionieren. Die Analyse ermöglicht die Identifizierung einer Gruppe prominenter multifunktionaler Städte an der Spitze und einer großen Gruppe weniger prominenter und spezialisierter Städte darunter.

Keywords world-system of cities, creative and cultural services, air transport, urban rankings, cities

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1. Introduction

The study of territorial processes on a global scale is a subject that has been widely covered by academics, largely due to the acceleration of the processes related to globalization (*Alderson* and *Beckfield* 2004; *Taylor* et al. 2013; *Knox* and *Marston* 2014) that have led to the need for effective methodologies when assessing the transformations and reconfigurations on different scales. Thus, the determination of the global urban system remains a complex task, not so much in the identification of the most important nuclei, but because of the constant changes that occur and the absolute impossibility of considering all of the elements and factors involved.

All of this is based on widely recognized interpretations of the role played by cities in the transition to a new phase, that of Global Capitalism, which was inaugurated with the crisis of the 1970s (*Amin* 1997) and which in the technology-production area is defined by the transition to a tertiary economy, whose production is dematerialized through services, information and knowledge. Thus, the process of industrial growth that urban agglomerations had experienced since the Industrial Revolution was eclipsed mainly by a concentration of activities linked to the highly specialized tertiary sector (advanced services to companies) (*Sassen* 1991).

This change has encouraged debate on so-called global cities and also on other related concepts like networks of cities and urban hierarchies. It should also be noted that in parallel the idea that certain cities control, coordinate and dominate the world economy emerged as a central element of the thinking in neo-Marxist studies when it came to understanding the political economy of the 1970s and 1980s and explaining the unequal North-South relations (*Smith* 2014). Consequently, many proposals have been made that attempt to define not only what is understood by a global city, but also their positioning in the urban system (*Hymer* 1972; *Friedmann* 1986; *Taylor* and *Derudder* 2016[1]). This has given rise to one of the most extensively covered topics in the geography literature over the last few decades (*Taylor* and *Derudder* 2016), undoubtedly increasing the understanding of the organisation of the modern world under conditions of contemporary globalisation (*Taylor* 2000).

Given this state of affairs, this paper proposes an exploratory exercise that could help to identify some roles considered essential in order for a city to perform global functions, beyond its regional and national hinterlands. Consequently, following some of the most informed approaches, when assessing the globality of cities, this paper takes into account the perspective based on creative, innovation, artistic and cultural services and the development of leisure-recreational activities. Many of these encourage, for example, urban theming, the promotion of cultural industries, the localization of companies and institutions in the forefront of research, knowledge and technology and the holding of mega-events (*Florida* 2002; *Amin* and *Thrift*, 2007; *Pratt* 2013). These activities also play a relevant role in planning, not only materially but also due to the image and the symbolic and intangible values they bring to the city (*Toffler* 1980; *Urry* 1995; *Bauman* 2009; *Gabriel* and *Lang* 2015).

Secondly, it is argued in this paper that while understanding the complexity of the phenomenon is an almost impossible task, the use of connectivity and centrality indicators can offer a glimpse of the plethora of different processes taking place in cities (*Córdoba* and *Gago* 2010; *Liu* et al. 2013). Because of its nature and the great diversity of demands it meets, air transport has been used in many papers as a valuable indicator of connectivity, since its implementation and development meets the majority of needs and functions of urban centres (*Derudder* 2006).

In addition, this paper seeks to look at the need to descend in scale in the analyses. Most of the examples available only consider the most important nodes, so the same cities have been repeatedly highlighted (*Gago* and *Díez-Pisonero* 2013). Here the intention is not only to identify those that occupy the top positions because they concentrate a large number of functions in a significant magnitude (polyfunctional cities), but also to evaluate those others where certain specifics create hinterlands, also of a broad scope although much more specialized. This idea is not new, but has been proposed in works such as those of *Marcuse* and *Kempen* (2000) who argue that globalisation is a process that manifests itself in different forms and intensities and not only in some cities at the top of the urban hierarchy.

The determination of the roles of these cities is of great geographic interest because it allows us to distinguish at least these aspects: (i) specialisations, or from a structuralist analysis category, a new international division of labour (material, intangible and

knowledge production, labour supply, new leisure and recreational spaces, symbolic power); (ii) complementarity and/or dependency relationships established between cities in relation to the new socio-economic demands.

Taking the aforementioned ideas, the main objective of this paper, which should be considered to be of a prospective or exploratory nature, is to describe the organisation of a world system of cities, which we believe to be complex, involving different thematic perspectives. From the methodological point of view, three synthetic indicators will be compared[2]: one that is fundamentally economic in nature, taken directly from the proposals of the Globalization and World Cities Research Group (GaWC, Loughborough University); and two others that have been prepared by the authors of this paper (Synthetic Index of Cultural Components, SICC, Synthetic Index of Air Transport Index, SIAT). To this end, the theoretical basis for the selection and elaboration of the different synthetic indices and the methodology for their comparative analysis are presented in the next section. The central part of the paper will show the results obtained, before the paper ends with a section setting out the conclusions.

2. Methodology: a world urban system through a comparative analysis of synthetic indices

A comparison between three urban indices will allow us to exploratively evaluate the functional specialisations and rankings of importance attained by the urban nuclei in each index. Firstly, we will introduce these indices.

2.1 The GaWC Urban System

From the thematic point of view, many works on urban hierarchies have attempted to analyse the ranking and role played by cities. One main approach has focused essentially on the study of the economic performance of the city by measuring some relevant indicators: for example, the number of headquarters of large multinational companies and also the flows between them, because these are considered fundamental vectors of globalisation (*Friedmann* 1995; *Alderson* and *Beckfield* 2004; *Taylor* 2005; *Rozenblat* and *Pumain* 2007; *Csomós* and *Derudder* 2014).

From this perspective it is worth noting the classification offered by the GaWC. The numerous acknowledgements of the work of this group (*Sánchez-Moral* 2008; *Bassens* 2012; *Watson* and *Beaverstock* 2014) show that its great contribution is the systematic compilation of data, on different dates, for advanced producer service firms, it being considered that this type of service is the best example of economic globalisation (*Taylor* 1997, 2004; *Taylor* et al. 2011). Despite this, as with most approaches to this issue, it has some disadvantages due to only using one type of indicator (*Robinson* 2002; *Nissel* 2004), the assumption that there are perfect and multidirectional connections within each company (*Nordlund* 2004) and the exclusive consideration of the advanced services sector.

Its methodology is based on the concept of the 'space of flows' of *Castells* (1989) and on the 'global city' proposed by *Sassen* (1991). Service relationships in corporate branch networks are measured and evaluated through the *interlocking model* (*Taylor* et al. 2002). Advanced producer service firms are considered to interlink the global cities through their intra-firm communications, where exchanges (especially of information, knowledge, direction and management, etc.) take place to create a global network of service centres. Despite its success, this approach is not intended to portray the overall nature of a city, as is set out by the authors in the book "World City Network" (*Taylor* 2004; *Taylor* and *Derudder* 2016). However, it must be considered a very valuable attempt to measure a particular process that is deemed important in enabling economic globalisation. The GaWC classifies a total of 253 cities into Alpha, Beta and Gamma, according to the representativeness of their interactions[3]. These results will be used in this research as one of the three synthetic indices to be considered (SIGaWC) and this will serve as a basis for the comparative analysis with the other two indices prepared.

2.2 Synthetic Index of Cultural Components, SICC

As mentioned in the introduction, the triumph of the New Economy (*Storper* and *Scott* 2009), contextualized in turn in so-called *cognitive cultural capitalism* (*Scott* 2008), highlights the need to develop new urban hierarchies and include cities whose core activity is not in the manufacturing sector but in the production of ideas, knowledge and intangible services, linked to the information society (*Krätke* 2012). This

intangible capital includes highly qualified and diversified human capital, symbolic capital, a high quality of life or an active, open and tolerant cultural environment (*Landry* 2012), aspects that are present in cities (*Nelson* and *Gaonkar* 2013; *Hutton* 2015). This perspective acquires great theoretical weight thanks to contributions such as the concept of the *celebrity city* (*Scott* and *Soja* 1986; *Soja* 2000), to which we can add those that argue for the value of creativity (*Florida* 2002; *Landry* 2012).

That said, it is interesting to note the modest academic attention devoted until recent times to creative, artistic and cultural services when determining the world urban system, despite the growing role of all these activities in the economy and also in territorial dynamics (*Howkins* 2007). In this regard, there are some publications in the field of consulting that incorporate dimensions related to cultural, creative and artistic services into recently published rankings (examples: *PWC* 2014; *Global Power City Index* 2015; *Reputation Institute* 2015). All of these represent a great advance in the studies as they consider numerous variables, some relating to services of a creative/cultural nature.

Consequently, our line of work argues for the opportunity to include these dimensions when producing rankings of cities, hence the elaboration of the so-called Synthetic Index of Cultural Components (SICC). For its elaboration, an open approach (without preselected cities) that combines eight major cultural and quantifiable dimensions, suggested by *UNESCO* (2009), has been used (*Table 1*). All of these refer to those manifestations linked to cultural production and consumption in the current phase of capitalism (*Amin* and *Thrift*

Table 1 Indicators to produce the Synthetic Index of Cultural Components (SICC). Source: own elaboration

DOMAINS	THEME	INDICATOR	SOURCE
1. Cultural and natural heritage	Heritage	World Heritage Cities	Organization of World Heritage Cities (OWHC 2012)
	Art	Museums	The Art Newspaper (2010)
		Art exhibitions	
2. Artistic presentations and celebrations	International music concerts	Opera performances	Official websites of artists
		Pop concerts	Official websites of artists
		Rock concerts	Official websites of artists
3. Education and knowledge	Education and knowledge	Universities	ARWU Ranking (2011)
			QS Ranking (2011)
		International students	QS Ranking (2011)
4. Books and press	Press	News agencies	Silver (2011)
		Newspapers	International Media & Newspapers (4IM&N 2012)
	Books	Publishers	Word Publishing Livres Hebdo (WPLH 2010)
5. Audio-visual media, cinema and interactive media	Internet	Internet browsers	Google (Feb. 2012)
			YouTube (Feb. 2012)
		Social networks (FB)	Socialbakers (2013)
	Cinema	Cinema festivals	Database Film Festival World (DFFW 2012)
6. Design and creative services	Fashion	Fashion capitals	Global Language Monitor (GLM 2011)
		Fashion Week	Fashions (2011)
	World exhibitions		Bureau of International Expositions (BIE till 2015)
7. Tourism	Tourism	International tourists	Euromonitor (2011)
		International congresses	Int. Congress and Convention Ass. (ICCA 2011)
8. Sports and recreation	Sports	Olympic Games	Olympic Games (OG 2012)
		Football	Fédération Internationale de Football Association (FIFA 2011)
		American football	American National Football League (NFL 2012)
		Formula 1	Federation Internationale de l'Automobile (FIA 2012)
		IAAF World Athletic-Champ.	International Association of Athletics Federations (IAAF 2011)
		ATP World Tour Tennis	Association of Tennis Professionals (ATP 2012)
		Theme parks	Themed Entertainment Association (TEA 2012)
	Recreation	Casinos	Forbes Magazine (2004)
			Businessweek Magazine (2012)

2007; *Hutton* 2015), understanding culture using a broad but also industrialised, monetised and commercialised definition (*Horkheimer* and *Adorno* 1979; *Bauman* 2009). Thanks to this definition, the indicators will approximate the cultural, artistic, creative and innovative dimension of cities from a measurable perspective (supply and demand) by assessing the number of users and the supply of resources. Methodologically, all indicators (collected mostly in 2012-2013), are subject to a normalisation process before assigning the corresponding discriminant weights to obtain a synthetic index. These reflect an urban hierarchy in relation to cultural services[4].

2.3 Air connectivity to assess the global system of cities

Another thematic approach to evaluating the world urban system involves the observation of the transport and communication infrastructures where all types of goods, people, services and ideas circulate, considering that these elements are determinant in the functioning of urban agglomerations (*Derudder* 2006). The link between transport networks and world urban system lies precisely in the definition of the latter as spaces of flows, in relation to the assertion that cities are produced more by all the kinds of interrelations established than by that fixed within them (*Castells* 1989; *Allen* 1999).

Based on this logic, numerous studies have been proposed using different perspectives and indicators (*Derudder* and *Witlox* 2005, 2008). In our opinion, the analysis of air transport networks stands out due to both the volume of work and the importance of the results (*Keeling* 1995; *Smith* and *Timberlake* 2001; *Button* and *Taylor* 2000; *Taylor* et al. 2007; *Allroggen* et al. 2015). Air transport has proved to be a valuable indicator when assessing the centrality and organisation of urban systems due to it allowing the intensity of the relationship between pairs of cities to be determined and, consequently, hierarchies to be established (*Córdoba* and *Gago* 2010, 2012).

Keeling (1995) provides compelling reasons to justify the use of this indicator:

- It is one of the few examples providing data on transnational flows of high-availability inter-city connectivity.
- Air networks and their associated infrastructure are one of the most visible manifestations of the interaction between global cities.
- In business there is still great demand for face-to-face relationships, despite the telecommunications revolution[5].
- Air connectivity is an important advantage for a city that aspires to the status of global city[6].

There are, however, some opinions which point out that the use of air transport as the only methodology of analysis for the determination of the global urban archipelago should be treated with caution. *Taylor* (2001) considers that infrastructure networks are important and necessary to support the network of global cities, but do not define it. Other authors argue that at no time can it be stated that air transport alone, much less simple passenger (or cargo) traffic, are indicators for determining the hierarchy of centres or their relationships (*Córdoba* and *Gago* 2010, 2012). This is why in this paper this indicator will be considered in combination with others. The following are some brief methodological specifications used to obtain the Synthetic Index of Air Transport (SIAT): (i) to select those airports (or airport systems, if there are several airports in the same city) whose international air traffic is over one million passengers (*ACI* 2011); (ii) to count the number of international air connections and frequencies (*OAG-International* 2011); (iii) to weigh both parameters according to the distance between the region to which the emitting city belongs and the region to which the destination city belongs; (iv) to turn the figures into ordinal values, which are ranked from highest to lowest. After these steps, an urban hierarchy in relation to the role of international air activity is obtained.

2.4 Comparative analysis of the three indices proposed

The comparison between the three indices introduced in the previous sections will allow us to evaluate, tentatively, urban functional specialisations and rankings. In this regard, the comparative analysis aims to assess what *Duarte* and *Ultramari* (2007) call urban inflections[7], that is, the variations experienced by the cities in each list, depending on its thematic approach. Here we would like to highlight that we have very clearly seen the emergence of urban rankings over the last decade, developed within the world of consulting and city marketing, which are starting to include multifunctional indicators in proposals, in our

opinion changing the traditional thematic approach to creating these rankings. These kinds of list combine different types of variables and indicators, and only a few are able to show the urban functions at the global level (*Gago-García* et al. 2017).

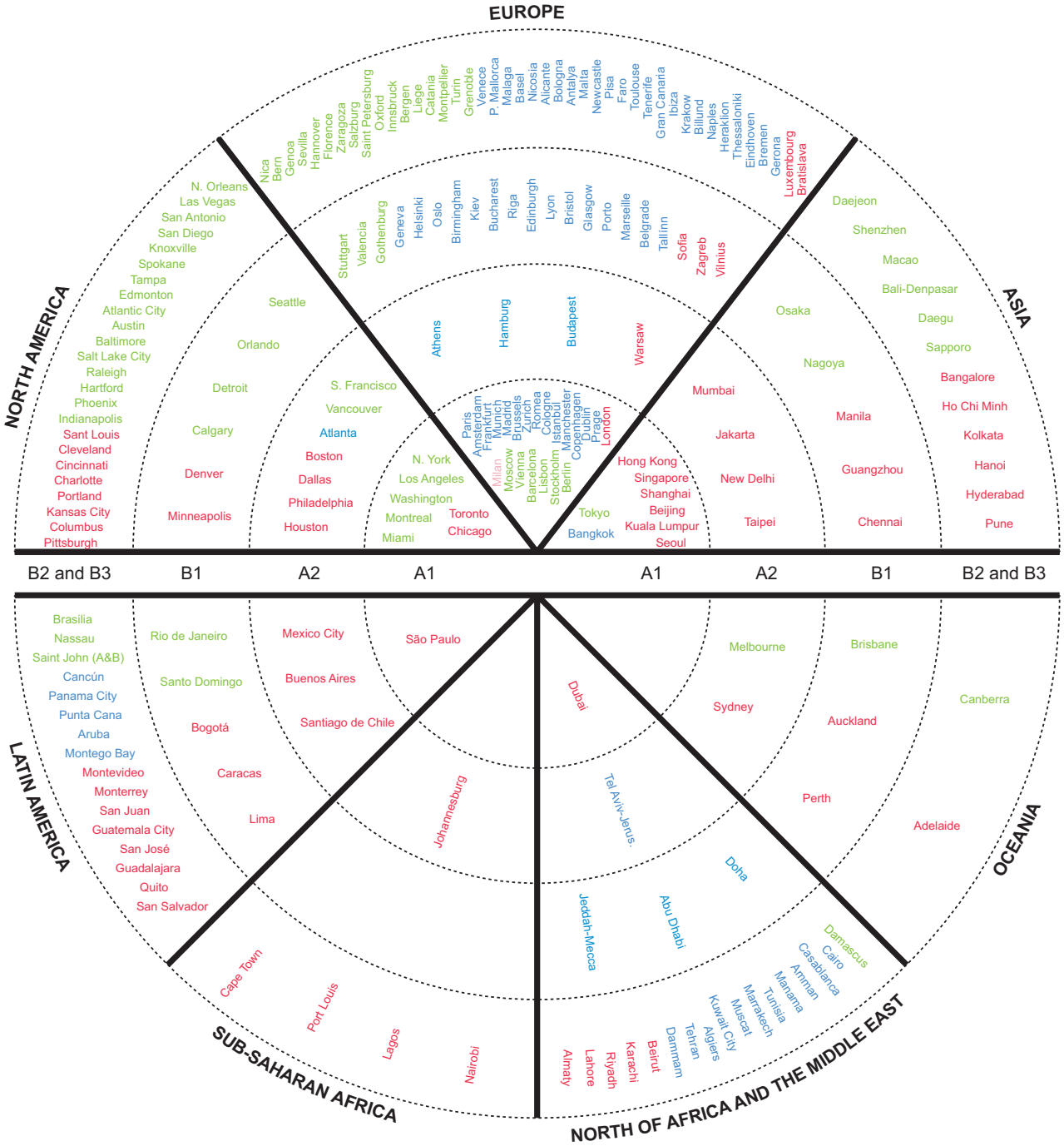
We should mention that the final purpose of this paper is not to produce a new ranking based on the data from the three indices considered, a task that is almost impossible considering the difference in their natures, but to show how some nuclei can have global functions in relation to different variables, territorially and socio-economically relevant today, that are global or globalising in nature. In order to achieve our purpose, we underline in the analysis the importance of the rankings, and as a result the values were ordered hierarchically (from highest to lowest) and converted into discrete (ordinal) data to obtain an ordered list of cities in each index.

There are some examples that relate to the analysis offered below, such as the work of *Taylor* et al. (2007) where airline passenger destinations and global service connectivities are compared, and the paper of *Limtanakool* et al. (2007) about the distinctive interaction of nodes depending on different thematic data. In our particular case, and from a methodological point of view, once the data had been obtained, the three indices were normalised so they could be compared. That is, the weighted values were ordered hierarchically (from highest to lowest) and converted into ordinal values since the SIGaWC and SIAT data are relational by nature and the SICC data are of a discrete nature (number of cultural activities/services). In addition, the three indices were limited to the top 250 cities to ensure that they were of the same size and that comparisons could be made[8].

Finally, to perform the crossed analysis of the three available indices a cluster analysis was used[9] which allows the sample to be classified into different groups with similar statistical behaviour (*Table 2*). After interpreting the groups obtained, these have been mapped using a spatial representation model (*Fig. 1*).

Table 2 *Classification of cities from the cluster analysis of the three synthetic indices. For explanation of abbreviations, see text. Source: research results*

ORGANISATION OF THE GLOBAL URBAN SYSTEM						ADDITIONAL INFORMATION				
Type of nodes		Scale criteria		Functional trend or specialisation		Cities		Average ranking		
Type	Characteristics	Sub-type	Characteristics	Colour for their representation	Trend/ specialisation	Number	%	SICC	SIGaWC	SIAT
A	Global multifunctional nodes	A1	Three indices: mean values in the Top 50	Green	Cultural	13	3.3	12.9	30.2	28.5
				Blue	AT	15	3.8	37.8	35.7	13.6
				Red	Economic	11	2.8	28.5	10.8	27.3
		A2	Three indices: mean rankings are below the Top 50 in one or two indicators	Green	Cultural	3	0.7	24.0	40.3	93.6
				Blue	AT	5	1.3	65.0	54.4	40.2
				Red	Economic	14	3.6	61.8	33.8	81.4
B	Specialised secondary nodes	B1	Strong ranking in three indices, although with mean rankings inferior to group A	Green	Cultural specialisation	12	3.1	65.9	115.7	126.3
				Blue	Specialisation AT	18	4.7	119.6	110.8	69.1
				Red	Economic specialisation	14	3.6	139.1	91.4	130.6
		B2 and B3	Strong ranking in only two of the three indices	Green	Cultural specialisation	72	18.2	123	206.8	224.8
				Blue	Specialisation AT	58	14.9	218.2	213.2	117.3
				Red	Economic specialisation	56	14.9	219.5	123.3	205.5



Note 1:
Although the world urban system analyzed in the explanation consists of 389 cities, this model shows 222 nodes, coincident with those that are among the first 150 rank in at least one the three indices. We consider this threshold to be significant for the correct understanding of the world system in an effort of synthesis.

Note 2:
Since a synthetic index that agglutinates the three indices considered is not made, cities are displayed according to the predominant functional indicator: first, the nodes that stand out in the cultural index (green), then in the airport transport index (blue), finally in the economic index (red). These nodes, in turn, are presented in the order in which they appear in the predominant synthetic index.

Note 3:
World regions considered in this investigation were taken from two official publications: United Nations (2006) and World Bank (2012).

Fig. 1 The Word Urban System according to the Synthetic Index of Cultural Components (SICC), Synthetic Index of Air Transport (SIAT) and Synthetic Index of GawC (SIGaWC), 2016. Source: own elaboration

3. Results

The characteristics acquired by the world urban system defined in the analysis (*Fig. 1*) allow us to corroborate the hypotheses (i) that the functional organisation of the urban system is complex and requires the inclusion of diverse variables for its definition and (ii) that it is advisable to evaluate a broad sample in which, in addition to the cities habitually considered as global, many of which have a strong presence in the three dimensions considered, others are identified as having a strong impact on one of the functions.

The analysis has differentiated between two major types of cities: the multifunctional global nodes (A nodes), widely discussed in the scientific literature, characterized by a strong international reputation; and nodes with a high functional specialisation (B nodes) whose identification is less frequent, and that also have wide areas of influence on many occasions. This fact also allows them to position themselves favourably in a scenario of urban competitiveness.

The A nodes correspond to cities represented in the three synthetic indices with a very strong reputation (A1 nodes: in the top 50 for the three indices; A2 nodes: ranked very high in one or two indices, in the top fifty). It is considered that these are global cities, true centres of power, which acquire representativeness not only in their respective countries but also transcend borders to play a role on the international stage. Consequently, they experience few mutations in their positions in the three indices because of their global character and the importance of their functions.

Geographically, these cities acquire a spatial significance in the northern regional subsystems. Thus, the cities identified are distributed as: 14 North American, 26 European and 12 Asian. This contrasts with the macrocephaly/bicephaly of the South, where only one or two cities become leaders. An unbalanced spatial organisation is thus defined (*Fig. 1*) which, despite recent transformations, seems to show significant inertia with respect to that seen more than four decades ago (*Wallerstein* 1974). However, the inclusion of some nodes from the Pacific, especially in Southeast Asia, is seen as a result of the growing economic development of this region. In any case, on the one hand, some *Norths* (the Centre) are described, with a high diversification of functions and a strong international reputation (high connectivity indicators). The large number of these cities allows for the integration and greater cohesion of the respective regional subsystems. On the other hand, there are the *Souths* (the peripheries), with a lower number of nodes and also less functional diversity and connectivity. To facilitate the understanding of the results, these are presented by major world regions.

3.1 Europe and North America

As it is said before, most of the global nodes are located in Europe and North America (*Table 3*). These are important not only because of the presence of advanced services, but also because they are leading centres in the production and consumption of creative, artistic and cultural services, as well as other functions. In this regard, connectivity facilitates the dynamics described, where air transport serves as an indicator of the far-reaching visibility of their hinterlands. Therefore, their multifunctional character is key to their definition. Some functional trends may be distinguished[10]:

- Cultural and creative nodes of high international significance with great potential for production and consumption (New York, Los Angeles, Milan, Barcelona, Berlin, Montreal). The hierarchical variation experienced by some of these nuclei with respect to the SIGaWC (economic-production ranking) doubled the number of positions. This is the case for Berlin (+50 positions), Barcelona (+33), Vienna (+30), Los Angeles (+12), Montreal (+36), Washington (+15) and Stockholm (+26). In these, the range of cultural services is broad. Precisely, significant cumulative effects may result from their combination, taking advantage of economies of scale, their enormous heritage, good connections, human capital and significant demographic volume, which translates into a large number of potential consumers.
- Apart from standing out for their economic and cultural functions, some nodes stand out as intercontinental airport hubs: Paris, Amsterdam, Madrid, Munich, Istanbul, Atlanta, amongst others.

Table 3 Considered cities in the world regions of Europe and North America. Source: research results

Nodes with functional trend in the creative, artistic and cultural services					Nodes where air transport acquires great relevance				
Type	City	SICC	SIGaWC	SIAT	Type	City	SICC	SIGaWC	SIAT
A Nodes					**A Nodes**				
	New York	1	2	4		Paris	3	4	2
	Los Angeles	5	17	41		Amsterdam	7	21	3
	Berlin	6	56	25		Frankfurt	71	19	5
	Barcelona	8	41	19		Munich	20	34	6
A1	Vienna	9	39	15	**A1**	Madrid	10	15	7
	Washington	13	28	53		Brussels	28	25	8
	Montreal	15	51	47		Zurich	55	32	10
	Stockholm	23	49	27		Rome	12	52	11
A2	San Francisco	22	27	79		Dublin	70	30	24
	Vancouver	29	63	74	**A2**	Athens	61	57	33
						Atlanta	59	40	39
						Hamburg	67	53	44
						Budapest	66	64	51
B Nodes					**B Nodes**				
	Stuttgart	43	97	56		Geneva	122	88	31
B1	Seattle	49	68	139	**B1**	Edinburgh	94	121	68
	Orlando	62	152	114		Porto	126	150	99
	Nice	39	251	57		Venice	86	251	48
B2	San Diego	74	102	251	**B2**	Marrakesh	145	251	89
	Catania	124	251	185		Antalya	184	251	92
	New Orleans	38	251	251		Mallorca	251	251	55
	Las Vegas	42	185	197		Malaga	251	251	58
	Genoa	53	249	251		Alicante	251	251	80
B3	Florence	78	205	175	**B3**	Malta	251	251	97
	Salzburg	88	251	211		Faro	251	251	109
	Atlantic City	100	251	251		Tenerife	251	251	117
	Oxford	104	251	251		Gran-Canaria	251	251	123

As we drop down the rankings (B nodes), there is greater difficulty when it comes to selecting cities that have prominent positions in the urban hierarchy. There is also less agreement in the academic literature when it comes to determining which cities should be considered (*Beaverstock* et al. 1999)[11]. However, these cities become significant in relation to their functional specialisation, which shows how other factors influence the organisation of the planet (*Table 3*). Some cities stand out for their strong cultural, artistic, creative and leisure services (in the most extreme cases there is a difference of more than 150 positions between the SICC and SIGaWC).

Some of the most interesting examples are: cities linked to the gambling industry and casinos (Las Vegas, Atlantic City), to theme parks (Orlando), to heritage and their role as urban destinations (New Orleans, Venice, Catania, Florence, Budapest, Edinburgh, Porto), to international conferences (Glasgow), to innovation and academia (Oxford), to sun and beach tourism (Mediterranean basin) and to events (film festivals: Venice, Nice, San Diego; music festivals: Salzburg and Stuttgart). In addition, the high ranking in air connectivity shows the dependence of the tourist places on this type of transport (Antalya, Mallorca, Malaga, Alicante, La Valeta, Faro, Santa Cruz de Tenerife, Las Palmas de Gran Canaria).

All of these cities have a very marked degree of functional specialisation that allows them, in many cases, to have a reputation beyond their immediate hinterlands. Although they do not acquire the global reputation of the A nodes, some manage to have a broad area of influence, on a regional and subcontinental scale, as can be demonstrated in analysing their air connectivity.

3.2 Asia-Pacific

Some cities in East and South-East Asia (*Table 4*) acquire great relevance (A nodes), although their functional trend is clearly economic-production in nature. This is evident from the Japanese nodes, some repeatedly identified in the rankings, from those belonging to the emerging countries (nodes for China and India) and from others in Southeast Asia.

This functional trend becomes more pronounced in the B nodes, which stand out for their dedication to economic-production activities, as evidenced in the SIGaWC index. Thus, cities that until recently were simply regional leaders in their respective countries (Guangzhou, Chennai and Hyderabad, among others), have today acquired a notable importance. In this regard, the demographic potential of this region, its cheap labour, the availability of resources and the development of the in-bond industry are some of the elements that favour new centralities (*Layne* 2012; *UNDP* 2013).

The growing development of the region is also evident from the necessary international air connections (*Burghouwt* et al. 2009). In this regard, although the

Table 4 Considered cities in the world region of Asia-Oceania. Source: research results

Prevailing index	Type	City	SICC	SIGaWC	SIAT	Var. SIGaWC-SICC Ranking		
						Sign	Number of Pos.	% Var.
Asia	**A1**	Hong Kong	19	3	17	▼	-16	-533.3
		Shanghai	24	7	45	▼	-17	-242.9
		Beijing	37	12	40	▼	-25	-208.3
		Singapore	14	5	22	▼	-9	-180.0
		Kuala Lumpur	41	23	35	▼	-18	-78.3
		Seoul	36	24	26	▼	-12	-50.0
Outstanding role in economic-production index (SIGaWC)	**A2**	Mumbai	85	16	75	▼	-69	-431.3
		Jakarta	83	26	103	▼	-57	-219.2
		Taipei	73	43	54	▼	-30	-69.8
		New Delhi	51	33	60	▼	-18	-54.5
	B1	Guanzghou	108	67	108	▼	-41	-61.2
		Chennai	110	74	165	▼	-36	-48.6
	B2	Hanoi	251	114	144	▼	-137	-120.2
	B3	Hyderabad	248	123	220	▼	-125	-101.6
Outstanding role in cultural or air transport indices (SICC or SIAT)	**A1**	Tokyo	4	6	28	▲	2	33.3
		Bangkok	44	42	23	▼	-2	-4.8
	B1	Osaka	34	110	101	▲	76	69.1
		Nagoya	60	166	167	▲	106	63.9
	B2	Macao	93	251	163	▲	158	62.9
		Denpasar	96	251	143	▲	155	61.8
		Shenzhen	92	105	251	▲	13	12.4
	B3	Daejeon	77	251	251	▲	174	69.3
		Spokane	84	251	251	▲	167	66.5
		Daegu	103	251	251	▲	148	59.0
		Sapporo	141	251	251	▲	110	43.8
		Pattaya	176	251	251	▲	75	29.9
		Pyenongchang	181	251	251	▲	70	27.9
		Phuket	207	251	170	▲	44	17.5
Oceania	**A1**	Melbourne	21	31	128	▲	10	32.3
		Sydney	18	10	83	▼	-8	-80.0
	B1	Brisbane	40	87	164	▲	47	54.0
		Auckland	97	71	116	▼	-26	-36.6
		Perth	112	104	158	▼	-8	-7.7
	B2	Adelaide	140	125	251	▼	-15	-12.0
	B3	Canberra	136	189	251	▲	53	28.0
		Wellington	209	170	251	▼	-39	-22.9

global nature of Tokyo cannot be doubted, the cluster analysis includes it in the A2 group as a result of its weaker position in the SIAT, providing evidence of its remoteness and lack of centrality with respect to Europe and its location in the Asia-Pacific. In contrast, cities such as Bangkok, Hong Kong, Seoul and Singapore stand out, becoming the centres that connect the region with the world-system.

There are also good examples that show the rise of creative, artistic and cultural services, based on the celebration of mega-events, the establishment of creative industries and leisure activities (*Table 4*). Among others, the following deserve special mention: Macao (gambling industry and casinos), Osaka, Nagoya, Shenzhen (theme parks), Bali, Pattaya and Phuket (sun and beach tourism) and Daejeon, Daegu and Sapporo (mega events).

As regards Australia, Sydney and Melbourne are the two leaders, not only when looking at economic criteria but also in relation to creative, artistic and cultural services (*Table 4*). Although there is some rivalry between the two, the fact is that Sydney has established itself as Australia's most significant economic-production node (*Tonts* and *Taylor* 2013), while Melbourne is considered the cultural heart (*Yigitcanlar* et al. 2008), one of the cities with the highest quality of life (*The Economist* 2015), and also a leader for its reputation for holding mega-sporting events (Australian Open in Tennis and F1 Price). In spite of the fame of both cities, their leadership in this paper is positioned at the second level as a consequence of their geographic remoteness and lack of centrality in the air transport network.

3.3 Nodes of the peripheral or semi-peripheral regions

The number of cities in what is generically called the South identified in the analysis is scarce. Only two of them, Dubai and Sao Paulo, are included in the A1 group. Consequently, the poor structuring of the territory of the economic peripheries is evident, with few nodes that facilitate the development of the respective regional and national subsystems (*Table 5*). Of note are Johannesburg and, to a lesser extent, Tel Aviv-Jerusalem. In Latin America, Mexico City, Buenos Aires and Santiago de Chile constitute the other leaders on the continent, although occupying a slightly lower ranking than the Brazilian city.

At this point we believe it is necessary to consider certain ideas in relation to the geographical meaning the literature grants to the inclusion of these cities within the world urban system. One of the interpretations of this, led by *Sassen* (1991), is that the cities from the North act in conjunction with new global cities from the South, forming more complex interconnected meshes that generate new geographies of the centrality. For this author, a recomposition of the scale models is occurring, defining norths in the souths and souths in the norths and, in this regard, some southern cities have the ability to break the traditional division between poverty and wealth, being included as global command centres.

In contrast, *Friedmann* (1986, 1995) and *Taylor* (2004) think that these cities are centres of control and direction, no longer only economic but also geopolitical and symbolic, and that in a context of the division of labour, spatial inequality manifests itself in the concentration of profits in a limited number of centres, almost all of them in the North. *Harvey* (1985, 1997) goes further in his interpretations, highlighting the crucial role of cities in the reorganisation of *capitalist spatial arrangements*, once some barriers imposed by physical borders (e.g. tariffs) have been removed. According to him, due to the systemic economic crises of 1968 to 1975, capital recomposed the value chains and location of production, generating a new international division of labour, where control and power structures are increasingly located in the cities. In most cases, the old structures endure, generating unequal conditions of competitiveness. While some cities adopt a competitive strategy of exploiting the labour force (peripheral and semi-peripheral cities), others seek a comparative advantage in the concentration of cutting-edge technologies and of activities increasingly based on creativity, innovation, and leisure-consumption.

In addition, we should note the increasingly important participation in global circuits of cities and regions as a result of tourism, which is a major function in some underdeveloped areas, being the framework for the representation of different cultural practices demanded by the mobile classes (tourists and travellers). In this regard, this activity has become a basic resource for implementing the development of localities and even regions and states, opening the door to a new form of external dependence that has spread across the countries of the South like a modernising wave (*Córdoba* and *Gago* 2012).

Table 5 Nodes of the 'South'. Source: research results

Characteristics	Prevailing index	Type	City	SICC	SIGaWC	SIAT	Var. SIGaWC-SICC Ranking		
							Sign	Number of Pos.	% Var.
Global multifunctional nodes		**A1**	Dubai	63	9	9	▼	-54	-600.0
			Sao Paulo	35	14	46	▼	-21	-150.0
		A2	Johannesburg	98	47	77	▼	-51	-108.5
			Tel Aviv-Jer.	72	58	34	▼	-14	-24.1
			Mexico City	30	20	66	▼	-10	-50.0
			Buenos Aires	26	22	84	▼	-4	-18.2
			Santiago Chile	50	44	131	▼	-6	-13.6
	Highly specialised in the creative, artistic and cultural services	**B1**	Rio de Janeiro	33	86	150	▲	+53	+61.6
			Santo Domingo	128	140	145	▲	12	8.6
		B2	Brasilia	125	179	251	▲	54	30.2
		B3	Damascus	132	251	251	▲	119	47.4
			Saint John	146	251	251	▲	105	41.8
Specialized secondary nodes	Nodes where air transport acquires special relevanceces	**B1**	Doha	109	117	29	▲	8	6.8
			Mecca-Jeddah	118	120	81	▲	2	1.7
			Abu Dhabi	120	83	49	▼	-37	-44.6
		B2	Cancun	156	251	59	▲	95	37.8
			Casablanca	251	95	62	▼	-156	-164.2
			Amman	251	122	64	▼	-129	-105.7
			Cairo	203	61	52	▼	-142	-232.8
		B3	Punta Cana	251	251	119	=	0	0.0
			Algiers	210	202	100	▼	-8	-4.0
			Aruba	251	251	129	=	0	0.0
			Montego Bay	251	251	138	=	0	0.0
			Sharm El Sheikh	251	251	157	=	0	0.0

4. Conclusions

The interpretation of the world urban system from a multifunctional perspective, valuing some specialisations that are either economic-production or related to cultural, knowledge, artistic, creative and leisure-consumption services and their combination with air connectivity indicators, reveals its complexity. The main evidence found through this analysis is that the functional specialisation of many nuclei, in relation to purely urban roles such as the location of cultural and heritage services, allows them to position themselves internationally. Consequently, their specialisation can allow them to achieve prominence and in many cases expand their area of influence.

This evidence must be related to the change of the production model and its manifestations in the cities, which has undoubtedly led to a reinvention of the city within the neoliberal economic paradigm. According to these ideas, activities linked to knowledge, talent, creativity and consumption play a fundamental role in urban organisation, and in international status, both as economic elements and because of their symbolic character and capacity to create a brand image (*Dinnie* 2011).

While the analysis of cultural, creative and knowledge services has provided revealing results, the possibility of exploring connectivity indicators, through the analysis of air transport, has also been explored. This has revealed interesting results in relation to the importance that certain cities acquire due to their geographical and topological centrality. It should also be noted that the pre-eminence that certain cities acquire in the air transport network tells us about the dependence of certain activities on having an adequate infrastructure if they are to develop (tourism, headquarters of multilateral political bodies, even the religious or spiritual function in cases such as Rome, Jerusalem or Mecca).

This paper is an attempt to reflect these realities and present a classification test for cities, including different variables that facilitate the understanding of a multifaceted, changing panorama, constantly being

reinvented and readjusted as a consequence of the acceleration of the mobility processes linked to globalisation. In this regard, it is important to underline that the global city concept is much more than a numerical position in a ranking, mainly being a geographical concept allowing us to understand the role of cities in globalisation (*Krätke* 2004; *Gago-García* et al. 2017).

To avoid making the mistake of absolutism, we should also say that, in keeping with a long tradition in geography, the characterisation of a city and its functional specialisations must be related not only to its relationships with the outside world but also to the socio-economic history of the regional and local areas, which is often forgotten. Therefore, these are bi-directional research areas, complementing each other, since it is impossible to recognize and explain the recent changes in the inner space of the cities without analysing the specialisations they fulfil at the different scales, where the world level acquires notable importance nowadays; and at the same time these specialisations also depend on the specific conditions of the territories, understood within a historical-time process.

Finally, we believe that thinking on the methodological proposals that allow for the identification of the world urban system must always be under construction, this subject will never be concluded. That is why our work, like any other of this nature, must be interpreted as having a clearly exploratory approach.

Notes

[1] For more information, it is recommended to visit the website of the Globalization and World City Research Group: http://www.lboro.ac.uk/gawc/

[2] The synthetic index concept has been used to allude to a ranking that results from a particular combination of indicators or variables.

[3] A complete list of the 253 cities studied by GaWC can be consulted on: http://www.lboro.ac.uk/gawc/world2012t.html

[4] The amount of data collected on the topic to produce the SICC is quite considerable. These data are available to all researchers that would like to use them for further research. Please contact the authors to request them.

[5] *Recruitment Confidence Index* 2005; *Amadeus and Oxford Economics* 2014

[6] Studies show an important relationship between the increase in jobs in activities related to innovation, research, creativity and knowledge and the development of the international air sector (*Button* and *Taylor* 2000).

[7] According to *Duarte* and *Ultramari* (2007), the main cities are characterized by a high immutability to such changes while the *inflections* seem to be more pronounced among cities in the lower part of the hierarchies.

[8] On unifying them, it can be seen that some cities do not have representation in a certain ranking. In these particular cases, they are assigned the value 251. With this value, those cities that are not present in the original index, or those that are present but appear below 250th position, are included.

[9] Software *SPSS Statistics 19.0* (K-means algorithm)

[10] We are not talking about functional specialisation *per se* given the high ranking they have in the three functional indicators, but rather a functional trend.

[11] For their presentation, these cities have been disaggregated on the basis of the number of functional indicators in which they acquire a strong ranking (B1 nodes, with a strong ranking in the three functional indicators, although with lower mean rankings than group A; B2 and B3 nodes, with strong rankings in one or two of the three functional indicators analysed, with a high degree of specialisation).

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