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## *The Changing Configurations of World City Networks*

Ben Derudder, Mike Timberlake & Frank Witlox

Introduction: mapping changes in urban systems

This special issue of *Urban Studies* is devoted to research examining changing patterns of transnational inter-city connectivity and hierarchy. Each of the papers represents an effort to contribute to the research on world cities and the world city network. These nine original contributions to this burgeoning area of research represent the work of scholars from at least ten countries studying the processes that link together most of the world's cities in kaleidoscoping patterns of change and stability. While this research represents a new direction in moving beyond description to explanations of change, it is a continuation and extension of a substantial body of pioneering work. Seminal scholars in the 'world cities' literature, such as John Friedmann, Saskia Sassen and Manuel Castells have made educated guesses about the degree of stability in global inter-city relations. Friedmann, for instance, posited that we are dealing with a system characterized by 'inherent instability' resulting in a very 'volatile' pattern of inter-city change (1995, p. 23, 36), while Castells used the metaphor of an 'urban roller coaster' to characterize the unsettled nature of the system (1996, p. 384).

Systematic empirical analysis of inter-city relations at the global scale is relatively new, with few examples in the 1980s and 1990s (e.g., Chase-Dunn, 1985, Smith and Timberlake, 1995), with these being mainly descriptive, involving static analysis (see Beaverstock et al. 2000). Thus it is no coincidence that to date there have been few analyses of shifting patterns in the 'world city network' (WCN)<sup>1</sup>. The purpose of this special issue is to begin to fill this lacuna in the literature by bringing together a number of longitudinal studies that explicitly employ network models and methods in answering questions about the transformation of transnational inter-city relations. Taken together, these contributions provide a broad and diverse representation of the WCN, conceptualizing cities as nodes in regional and global networks, illuminating arguments about how cities expand, consolidate or reduce their nodal connectedness within the network. Indeed, at the end of the day, we may need to agree that there is not one WCN, but several world city networks, depending upon which specific connectivity processes scholars feature in their analyses.

Generally speaking, the papers in this special issue are part of a broader literature dealing with the changing geographies of 'urban systems' (cf. Pred, 1977). In this literature, data from national censuses – often population sizes of cities – are typically used to define 'national urban hierarchies' (see, however, Pred, 1973), after which changes in these hierarchies are examined and interpreted. In this context, the paper by Polèse (2010) sets the scene for this special issue by continuing this line of enquiry. The long timeframe adopted in his paper (compare with Soo, 2005; Turok and Mykhnenko, 2007) allows him to discern different patterns of stability/change in different national urban hierarchies across the settled world. In Europe, for instance, these hierarchies show significantly less variation

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<sup>1</sup> The most notable exceptions are papers by Taylor et al. (2003), Taylor and Aranya (2008), Smith and Timberlake (2001) and Alderson and Beckfield (2007).

over time than in other parts of the world (especially in 'developing countries'), which is explained by the observation that urban hierarchies harden as they mature.

In his paper, Polèse (2010) explicitly adopts a cross-country perspective. However, this implies that the study of cities as part of an overarching 'system' is nationalized and therefore territorialized at the expense of understanding the global context of major cities like London and New York (see, however, Chase-Dunn, 1985). Though one can find a few precursors (e.g., McKenzie, 1929), theorizing cities globally began in earnest in the 1980s. It is probably no accident that this followed close upon the heels of globalizing perspectives on national development, such as Wallerstein's "world-system" paradigm. As others had done with nations/states, urban scholars began to "globalize" cities through a series of influential writings, first as international financial centers (Cohen, 1981), then as "world cities" (Friedmann and Wolff, 1982; Friedmann, 1986), and further as "global cities" (Sassen, 1991). Thus a literature emerged in which the study of cities broke free of national containers. More recently, we have moved from conceptualizations of world city-formation to conceptualizations of world city network-formation: scholars study cities in the context global systems of relationships, as parts of multiplex transnational urban networks (Taylor, 2004). The other papers in this special issue begin from this globalizing tradition and focus on *transformations* within WCNs. In other words, what sets apart the remaining papers in this special issue is that, rather than interpreting urban change as a matter of cities 'rising' or 'falling' in a series of unrelated 'national urban hierarchies', cities are assessed as changing connective configurations in complex transnational networks defined by the circulation of commodities, capital, people, and information (Smith and Timberlake, 1995; Brown et al., 2010).

#### Shifting WCNs: ideas and data sources

Analyzing change in WCNs implies a proper conceptualization of what cities 'are' and what 'connects' them. The papers in this special issue collectively reproduce the dominant approaches in the WCN literature at large in that they are premised upon two foundations, which, following Derudder (2006), may respectively be labeled (i) the corporate organization approach and (ii) the infrastructure approach. The corporate organization approach starts from the observation that relations between cities are primarily created by firms pursuing transnational location strategies, whereas the infrastructure approach focuses on a series of enabling infrastructures that underpin border-crossing urban networks. In any case, it is claimed that the spatiality of these corporate or infrastructure networks may shed light on (shifting patterns in) the geographical outline of transnational urban networks.

Three of the papers in this volume are premised on the assumption that firms pursuing global strategies are the prime agents in the formation of transnational urban networks. These are the articles by Alderson et al. (2010), Derudder et al. (2010), and Orozco-Pereira and Derudder (2010). The latter two contributions are set within the context of the Globalization and World Cities (GaWC, <http://www.lboro.ac.uk/gawc>) research network in that both papers draw upon the GaWC methodology for studying transnational urban networks. This method is based on the assumption that advanced producer service firms 'interlock' cities through their intra-firm communications of information, knowledge, plans, directions, advice, etc. to create a network of global service centers (Taylor, 2001). Derudder

et al. (2010) build on this model, marshalling data gathered in 2000, 2004 and 2008 on the location strategies of firms across cities. The authors analyze the resulting cross-sectional snapshots to describe the main changes over the period 2000-8, while Orozco-Pereira and Derudder (2010) try to interpret changes across the period 2000-4 by using connectivity changes of cities as the input for a model explaining patterns of change.

Alderson et al. (2010), in turn, continue their earlier work on this topic (Alderson and Beckfield, 2004) in which they take a broader perspective in that relations between cities are described through the links between headquarters of multinational enterprises and their subsidiaries (without differentiating between service firms and other sectors). Using data on links between headquarter and branch locations of the world's 500 largest multinationals firms in 1981, 2000 and 2007, they analyze how extensively the global urban hierarchy has been altered over this 1981-2007 time period. In addition, they also examine whether patterns of change involve concentration of connectivity and/or whether uneven geographies of connectivity are cutting across pre-existing patterns of global inequality at the cross-national level.

The paper by Matthiessen et al. (2010) cannot be subsumed as conveniently under this 'corporate organization approach'. Nonetheless, their approach has some remarkable parallels to the contributions described immediately above in that inter-city relations are defined and consecutively measured by focusing on inter-city flows of institutionally embedded knowledge and information: in their paper, the authors define a WCN premised upon a global system of knowledge centres. This implies that in practice the connectivity of cities is gauged through networked elements of research output (i.e. co-authorship and citing patterns across space). By looking at evolving patterns between 1996-8 and 2004-6, they are able to put forward the major patterns of change in the connectivity of cities as knowledge centres.

The remaining papers adopt an 'infrastructure approach' in that they collectively begin from the common-sense observation that advanced telecommunication and transportation infrastructures are unquestionably tied to key cities in the global economy. These enabling (tele)communication and transportation networks undergird the flows of capital, people, and information which are fundamental to the connectivity of key cities in WCNs. It is therefore no surprise that the geography of these networks is used to invoke changing spatial imageries of WCNs (Mahutga et al., 2010; Pirie, 2010, Vinciguerra et al., 2010; Córdoba Ordoñez and Gago García, 2010).

Both Pirie (2010) and Córdoba Ordoñez and Gago García (2010) analyze shifting inter-city connections among cities that are not generally covered in WCN research, and do so by looking at the changing geographies of the airline connections in/to/from these regions. Pirie (2010) does this by looking into the networks linking South Africa's major urban centres to places on the continent and beyond in the period 1994-2007, while Córdoba Ordoñez and Gago García (2010) use a diachronic analysis of Latin American aerial connectivity to evaluate (i) the growth and the degree of cohesion of the region's 'internal' urban networks and (ii) the existence of changes or continuation in the 'external' urban networks in the period 1970-2008.

Mahutga et al. (2010) also look at shifting patterns in the flows of airline passengers amongst world cities, but rather than merely describing these changes, they are examined through a Wallersteinian world-systems lens (see also Alderson et al., 2010). This is achieved through an analysis of the (shifting) relationship between the structure of the city-to-city network of global airline passenger flows and the interstate world-system. They suggest that there has been some modest convergence in the distribution of connectivity in the WCN, which can mainly be attributed to the upward mobility of cities located in the semi-periphery and East Asia.

Vinciguerra et al. (2010) use data on Internet backbone networks to model changing inter-city relations. Rather than describing changing connectivity of cities in space and time as in Derudder et al. (2010) or Matthiessen et al. (2010), or explaining changing connectivity in terms of world-systems terms or world regional patterns as in Alderson et al. (2010) and Mahutga et al. (2010), the authors seek to uncover the main processes driving connectivity by modeling the effect of geographical distance and country borders on link formation between European cities in infrastructure networks.

### Steps forward

Because the papers in this special issue make use of different datasets, methodologies, regional settings and timeframes, it is impossible to systematically compare their main findings. It is, however, possible to point to a number of collective steps forward.

First, it can be said that the papers in this special issue collectively tackle the commonly voiced criticism of the WCN literature that it *'disproportionately' focuses on a few large metropolitan centers in the Global North* to concomitant neglect of all other cities. The most trenchant critique along these lines has been by Robinson (2002, p. 536), who complains that 'millions of people and hundreds of cities are dropped off the map of much research in urban studies'. This exclusion has been from two 'maps': (i) the geographical map of world cities wherein most cities in the 'South' are missing; and (ii) the conceptual map of world cities which focuses on a narrow range of global economic processes so that myriad other connections between cities are missing. However, *all* cities experience contemporary global processes, and globalization can therefore not be construed as affecting just a few privileged cities. Subsequently Robinson (2005, p. 760) has conceded that the WCN literature now covers 'a much wider range of cities around the globe' thus lessening the exclusion from the map. A number of papers in this special issue further rectify this baleful situation in geographical and conceptual terms.

Perhaps the most straightforward examples here are the analyses squarely dealing with parts of the world that have long been neglected in this literature, i.e. South Africa in Pirie (2010) and Latin America in Córdoba Ordoñez and Gago García (2010). Both studies employ airline data to map changing patterns of involvement in transnational urban networks. This 'airline approach' continues a long line of research (see Keeling, 1995) which has been criticized for its data flaws (Derudder & Witlox, 2005). However, especially Pirie (2010) makes a case for using this straightforward data source because - rather than in spite of - its very general flow pattern: using airline flows directs our attention away from a narrow focus on a range of producer services or headquarter locations as guiding criteria for assessing

world city-formation in a globalising and consumerised age. In this context airline flows are ideal for mapping wider inter-city networks of global economic integration.

In addition to analyses of regions not commonly covered in WCN research, a number of papers take a more encompassing 'global' view in which cities in the 'Global South' are put on the map by invoking world-systems analysis (e.g. Alderson et al., 2010; Mahutga et al., 2010). Although the explicit hierarchical ordering of the world adopted in the world-systems perspective (i.e. core, semi-periphery, periphery) re-asserts the 'prominence' of cities in the 'Global North', in this point of view the 'power' held by actors within 'world cities' is explicitly linked (rather than being assumed) with their dominance over actors in cities in other parts of the world (see, however, Jones 2002).

Second, perhaps the most significant breakthrough is that a number of contributions to this volume have begun to move beyond merely describing, or "mapping", the WCN to offering explanations for its emergence and transformation. That is, although a number of papers still confine themselves to mapping and describing change in WCNs (e.g. Derudder et al. 2010; Matthiessen et al., 2010), other contributions explicitly focus on systematically explaining these patterns of change. To date, there have been few efforts to tackle this issue. One major exception has been the analysis by Taylor and Aranya (2008), in which the authors test a number of hypotheses regarding the determinants of connectivity change in the period 2000-4. For instance, they examine a 'political hypothesis', which suggests that state capital cities will have experienced positive change in connectivity during this period. Another set of hypotheses relates to large-scale geo-economic transitions. In the end, however, only the relative negative connectivity changes for cities in the USA and cities in sub-Saharan Africa could be accounted for, whereby both shifts are obviously echoing the decline of these regions in the global economy in this time period. After having used the different hypotheses as independent variables in a regression model, Taylor and Aranya (2008, pp. 12-13) come to the conclusion that "the regression is statistically significant at a very low probability level. However, the relationship itself is relatively weak; the correlation of under 0.3 translates into only 6% (after adjustment) of city connectivity changes being accounted for ('explained') by the independent variables."

The paper by Orozco-Pereira and Derudder (2010) is an explicit follow-up to the Taylor and Aranya (2008) analysis in that a similar exercise is carried out with a much broader set of variables. By including variables gauging the effect of, *inter alia*, the presence of skilled labour force, a well-developed infrastructure, deregulated markets, and agglomeration economies, etc., the authors delve deeper into the processes driving WCN change. This explanatory approach is also adopted in Mahutga et al (2010) and Alderson et al. (2010), in which the authors focus on wider regional and hierarchical spatial divisions for clarifying change in WCNs. Thus Mahutga et al. (2010) argue that WCN change can be at least partly understood by calling upon the spatial ordering put forward in world-systems analysis: they show that cities in semiperipheral countries seem slightly more upwardly mobile on average than those in peripheral countries, which is consistent with the interpretation that a city's embeddedness in a semiperipheral country is less constraining as time proceeds, and that any decoupling of the world city-system from the world-system is driven in part by the rise of cities in the semiperiphery. Nonetheless, together with Alderson & Beckfield (2010), they corroborate the central tenets of world-systems analysis in that, despite some substantial restructuring, the WCN increasingly maps onto patterns of global inequality in the inter-state system: cities in core countries have, on average, grown relatively more connected in the

recent decades, not less. In other words, although critiques of the WCN literature have repeatedly expounded its 'Western' preconceptions, it is perhaps useful to emphasize the fact that many scholars working on the WCN conceive their research as an effort to map—and, increasingly, explain—global inequality.

A rather different approach to 'explaining' evolving patterns of inter-urban connectivity can be found in Vinciguerra et al. (2010). Unlike most other papers in this special issue which—at least implicitly—adopt a loose political-economy approach to understanding the WCN, the authors take a modelling approach in conceptualizing WCN change as a preferential attachment process. Drawing on the Barabasi-Albert model that is extended with parameters incorporating barriers to link formation (i.e. geographical distance and country borders), they present a post-hoc analysis of the evolving connectivity of European cities in infrastructure networks.

The diversity of approaches to explaining WCN change (quantitative modelling versus world-systems analysis) points to the fact that that much more - and perhaps very different - work remains to be done. We hope that the unique and original contributions to this special issue will prove to be a useful first step in producing systematic research that goes beyond mapping and describing the WCN to explaining its transformation over time. We look to reading responses to this work as well as future research that carries the project much farther.

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