Article

Understanding the global ecosystem of city networks

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Abstract

Cities are formalising collaborations across borders at an unprecedented rate: 'city networks' now form a wide ecosystem of global partnerships between local authorities that is often underestimated. It might be time to think of city networks more explicitly as institutionalised and presenting a challenging form of more-than-local urban governance. To do so, our essay mixes a review of the overall global landscape (beyond the environmental sector where most of the literature is to be found), with both a network analysis of how these institutions work as a web of connections, as well as an 'inside out' view of how they are managed and what the challenges of that are. We do this by analysing a database of 202 of these networks, both statistically as well as via social network analysis. We find that: international initiatives are on the rise, but this context of partnerships has a well-established history, producing a wealth of information and outputs and offering a complex organisational landscape for cities to reach out beyond their local confines. We measure the relationship this has to the integration of cities into the global economy, the pathways it opens for further internationalisation of city leadership and the patterns of partnership with business and international organisations that it implies.

Keywords

city networks, globalisation, governance, networks, social network analysis

摘要

城市正以前所未有的速度将跨境协作正式化："城市网络"现在形成了地方当局之间广泛的全球合作生态系统，但这一点往往被低估。将城市网络更明确地视为一个制度化的事物，并提出一种超越地方的、挑战性的城市治理形式的时机或许已经成熟了。为此，本文将两个方面相结合，一个方面是回顾全球整体局面（超越大多数文献所关注的环境领域），另一个方面是对这些制度如何作为一个联系网络起作用的网络分析，以及对它们如何被管理和面临哪些挑战的"由内而外"的观察。我们的方法是分析一个202个此类网络的数据库，既包括统计分析，又包括社交网络分析。我们发现：国际倡议正在兴起，但这种伙伴关系有着悠久的历史，产生了丰富的信息和产出，并为城市提供了一个复杂的组织环境，使其能够超越当地的局限。我们衡量了这方面与城市融入全球经济之间的关系，其为城市领导力的进一步国际化开辟的道路，以及其所蕴含的与企业和国际组织的伙伴关系模式。

关键词

城市网络、全球化、治理、网络、社会网络分析

Introduction

Why would we care about what the mayor of our city does when taking part in international summits? Does it really shape the long-term sustainability of our streets and parks? Does it make a tangible difference to our study sites or urban debates across academe? The United Nations, and much of the media, increasingly seem to think so. After a period of relative anonymity, formalised associations of municipalities are in the spotlight of global agendas such as those of the UN Sustainable Development Goals (SDGs) and the Paris Agreement on climate change (Parnell, 2016). Many now call for a greater recognition of the centrality of cities in today's most pressing sustainability issues, both as drivers of environmental change as well as actors key in implementing collective solutions (e.g. Watts, 2017). This has increasingly been the case in both geographical (Oosterlynck et al., 2018) and international (Gordon and Johnson, 2018) research over the last two decades but the advocacy for attention to the global implications of the so-called 'urban age' has a long lineage in academia more generally (Gleeson, 2012). Numerous international actors have been campaigning for greater attention to urban issues and the role of local governments in global governance. This is, for instance, enshrined in the recent special attention paid by the Intergovernmental Panel for Climate Change (IPCC) to both these dimensions with an upcoming special report and an already available summary for urban policy-makers of the latest IPCC assessment (Bai et al., 2018). Yet, this also extends well beyond the climate sphere with, for instance, over 30 years of expertise within the World Health Organisation in campaigning and networking 'healthy cities' for global health action (Acuto et al., 2017).

Even the security sector has now woken up to more explicit engagement with the implications of globally linked cities and city leaders (Tallis and Klaus, 2018). With increasing visibility in the public and in research, these 'city networks' (Acuto, 2013) are now emerging as important players in tackling global environmental but also social, cultural, economic and security challenges and in ensuring the achievement of many of the global sustainability targets set by the international community in the UN's Agenda 2030 (Rodriguez et al., 2018). More refined and visible arguments are made now for engaging with networks of cities with, for instance, both World Economic Forum, with its global council on urbanisation, and G20, with its 'Urban20' track, recently paying particular attention to them as drivers of global agendas. Networks themselves have held prominent spots on the international stage as with key advocacy around the Paris Agreement on climate or the Sendai Framework for Disaster Risk Reduction. Globally, there might be more than 300 such networks operating in and across the five continents. Yet, often the landscape of how they work is spoken about with limited evidence and on the basis of recurring examples such as Local Governments for Sustainability (ICLEI) and C40 Cities Climate Leadership Group.

Here we would like to argue, and demonstrate, that this reality is, first, far from

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anecdotal. Rather, there is a tangible 'ecosystem' of city networks underpinning the rise of local governments in international processes and settings. Relatedly, and second, that we need to approach this landscape methodologically to generate an evidence-based understanding of how such an ecosystem works. And, third, we call upon scholars and policymakers to remember that, as institutionalised entities, we should carefully understand what political economy this system underpins and how it can drive a shift in the networked bases of urban governance. As recent writing in urban studies has begun arguing, better evidence for this 'global' role played by an increasingly 'networked urban policy' (Davidson et al., 2019) in planetary sustainability is needed, and the same is valid for the ways we theorise of urban governance today. We propose here to do so by offering a systematic analysis of the global landscape of city networks, its key characteristics and the pathways it charts for cities to contribute to global sustainable development challenges. Whilst we can recognise that some attention to this empirical and practical problem has been paid in global *environmental* politics (Gordon and Johnson, 2018) this has rarely crossed thematic areas and policy sectors. Little systematic empirical analysis – for instance, analysis that has sought to identify longitudinal trends, network management and governance challenges, or mapping participation by cities and nongovernmental actors (e.g. Bansard et al., 2017) – is currently available to students of urban politics, international relations, UN officers and network managers alike. These have often been perceived as consultancy matters left to city networks or academics in their 'hired hands' hats, rather than constituent elements of a new theory of networked urban governance – a bias we aim to redress here. To a degree, we could even argue that, potentially, some practitioners might be better equipped today with

evidence as to the global geography of city networking than most urban researchers in the academic world. To counter this, we have already offered a snapshot of the global geography of city networking in earlier research (Acuto, 2016). Here we take this approach further, stressing much more explicitly and methodologically the ecosystem nature of this landscape, arguing more directly for a closer eye to the politics and governance underpinnings of institutionalised city networking. This has required not just an update of that analysis but two further methodological steps: on the one hand, more in-depth analysis (statistical and qualitative) of the governance and management of networks themselves, as with questions of membership or budgetary constraints. On the other hand, this has been coupled with a more systematic view as to what the networked geography looks like and how networks intersect with each other. For the latter, we therefore relied on a social network analysis (SNA) approach, treating local governments, their networks and formal business/public partners of these networks as nodes, and treating city memberships in city networks and network partnerships with businesses and public entities as edges or ties. To ground-truth our database work with those very entities we studied, the networks, we complemented more qualitatively our analysis with a set of four 'technical working groups' with representatives from a sample of city networks (international, regionally specific and national; topical or general purpose; large membership or small network size – 42 networks in total) run in October 2016 (Quito), December 2016 (Oxford), June 2017 (London) and February 2018 (Kuala Lumpur), to provide additional testing and some important critiquing of the image our statistical and SNA findings present via semi-structured engagements with the very practitioners and institutions we aim to depict.

Seeking to capture the state of the 'field' across different policy sectors, our review also relies on an update of our original database of city networks (Acuto and Rayner, 2016), which is therefore analysed in two formats: across the entirety of the 202 networks data set and via a more specific SNA on a sample of 100 internationally focused networks from the bigger sample, surveyed directly and covering 10,536 cities worldwide.[1] Building on that original study, this global review of city networks has been carried out by the Connected Cities Lab at the University of Melbourne, led by Michele Acuto, in collaboration with researchers at University College London and Benjamin Leffel at University of California Irvine (between 2015 and 2017). It has been developed with funding from the UK Economic and Social Research Council between 2014 and 2017 and the University of Melbourne between 2018 and 2019. It includes data derived both from desk research and from interviews directly with network managers and secretariats. Where it was not possible to undertake research on the full scale of the 202 cities database, or where data were not included in the original survey for the larger data set, we have developed a representative version of the same set with additional characteristics (in particular four data points: core budget source, budget trend, regularity of review of network operations and secretariat composition), centred on a sample of 100 networks. This was primarily based on direct survey of the networks, weighted by geographical coverage to align with the overall 202 networks database, and with updated data sourced with the same methods. Findings derived with this method are highlighted with a tilde (˜). In what follows we begin with a more descriptive outline of what the global ecosystem of city networks looks like, followed by more inward-looking considerations as to how networks are managed. We then focus on an SNA analysis of membership and partnerships specifically, before offering a few agenda-setting conclusions on the need for more in-depth analysis of 'global urban governance'.

The global landscape

Thinking of city networks as a (growing) phenomenon in international politics brings about a number of initial questions on the shape of the ecosystem, starting at least from a very practical triad: what does the landscape of formalised city networking look like internationally and what themes does it cover? What are the key longitudinal trends that have shaped the last century? And what do these networks produce? All too often, these networks are reported on in the media alongside their visible summits and conferences, and in many cases as a relative novelty in international affairs. Yet is this really the case? To begin with, it is important to grasp the overall growth trajectory of this landscape. If at the turn of the past century (1900) only three of today's networks were active, by 1960 this had grown tenfold (36), with over 100 by the mid-1990s and a steady rise throughout the following years showing no signs of slowing down. The biggest jump in numbers recorded in our data set is the end of the Cold War with a shift from 59 networks in 1985 to 107 just a decade later. Environmental concerns such as those expressed in the 1992 Earth Summit and its *Agenda 21* have been a key driver of this expansion, but we should not underestimate the growth in national associations of cities too. Henceforth, we witness a steeper curve: as many city networks were founded in the 15 years between 1995 and 2010 as were set up in roughly the whole 20th century between 1900 and 1985. At least 40 new networks have been set up since 2010, with the overall number likely even higher. Whilst Sister Cities International dates back to 1956, some of the most visible contemporary

city networks have emerged in this more recent period. This is the case, for instance, of United Cities and Local Governments (2004), and more recently 100 Resilient Cities (2011) on urban resilience, and the Global Covenant of Mayors (2014) on climate change.

As these examples testify, we see a clear expansion in international city networking and an institutionalisation of the international dimension of the ecosystem depicted here. While national networks such as the South African Cities Network continue to represent the largest type (53% in total and 27% of the networks created since 2001), there is also a growing trend for regionally based urban associations focused, for instance, on Europe, Latin America or Asia (26.5% in total, representing 62% of networks created since 2001) such as CityNet or Eurocities. International networks such as UNESCO Creative Cities Network (20% of the total, 28% of the networks created since 2001) are starting to populate the overall landscape quite substantially, but it is also telling that regional networks have seen an important growth in recent years. To put it simply, city networks are numerous, growing, crossing national boundaries and likely to remain in the near future. What this story also tells us is that we can go beyond the well-established 'node and network' bias (Agnew, 1994) of representing cities as but hubs in a geography of connectivity which has dominated much quantitative analysis of city networking, recognising networks in themselves as *institutions* in the political geography of (international) urban development.

From this point of view, treating networks as institutions, we are confronted with another clear finding: city networks are not just connections but actual producers of a vast variety of policy outputs and knowledge mobilisation mechanisms. When assessing the overall 202 networks database, we find many city networks not only produce regular reports (in 62% of cases) but also joint pilot programmes and common policies (32%), whilst also acting as key media for information exchanges with 56% maintaining blogs, social media accounts or online noticeboards, 39% issuing newsletters, 9% publishing magazines or journals. Conversely, if this burgeoning activity is linking cities and spreading information, it would be profoundly misleading to represent networks as expressed solely through the mayoral summits often reported in the media. As we outline below, this also underscores that, seen as institutions, the networks become actors for (or at least agents of) their member cities and need to be accounted for as tangible elements of the landscape of global and local urban governance.

Yet, where do networks concentrate their activities? In our database, nearly 50% of city networks have governance as the primary focus of their events and outputs. This does not necessarily mean these networks work only on governance but rather that half of currently existing organisations put governance at the front of their members' agenda. Environmental concerns also remain central to the overall picture (29% of networks), whilst issues pertaining to energy are far less common (9.5%). This is followed by inequality (18.5%) and culture (11.5%). Gender (7.5%) and peacebuilding (8.5%) remain important concerns, with 'other' themes (including health, technology and urban security) less prevalent but cumulatively accounting in total for 13.5% of networks. Yet today, rarely are networks centred on a single issue: by our estimates, nearly 71% of city networks could be described as 'multi-purpose' in that they formally act across at least two major areas of policy, typically coupling local governance with another major issue, as with the Asian Network of Major Cities 21 or the international Strong Cities. This is a critical issue we will reiterate through our research note. If
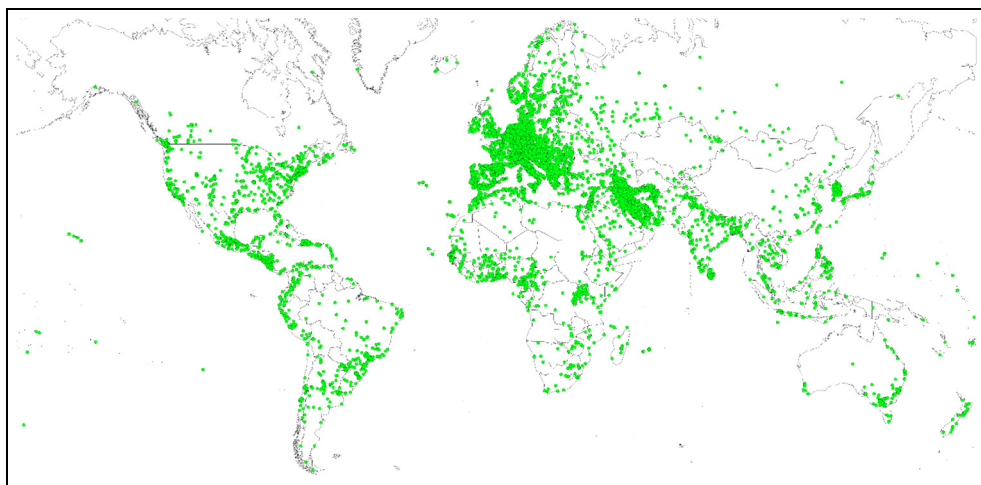
Figure 1. Network membership map (as of 2017)˜.

major multilateral agendas that emerged in recent years, as with the SDGs and the Paris Agreement, stressed the centrality of cross-sectoral collaboration (e.g. between health and climate, culture and migration, disasters and inequality), city networks seem to be well aligned to offer these effective bridges. For example, C40 is currently partnering with the Open Society Foundation and the Swiss Agency for Development and Cooperation to support the newly created Mayors Migration Council towards a more explicit work programme on how climate emergencies are affecting migrant integration in cities. Many of these examples seem, to us, promising venues to deliver on cross-sectoral needs with a focus on tangible everyday implementation on the streets of cities the world over. Yet, this recognition underscores that it is key to recover the networks themselves, not just as spokes of a number of nodes (i.e. cities, or more precisely local governments) but as institutionalised entities in themselves which deserve attention but also careful critical scrutiny as to the political economy they are steeped in. Opening up the proverbial 'black box' of network management and

seeing this in the wider context of the global landscape we have depicted thus far is, in our view, essential to understand how this ecosystem is changing and how it operates.

Managing networks

Managing networks of cities connected across often vast distances is no easy task. The available scholarship on city networks rarely engages with the everyday mundanity of network management and organisation. Aside from a few quasi-ethnographic studies of networks (e.g. Bouteligier, 2013), the focus of scholarly work on this front is typically oriented towards the outputs and impact networks have, or their relationship with wider questions of global governance. This, as we have argued elsewhere in relations to critiques of C40 (Acuto and Ghojeh, 2019), might require a little more explicit 'inside out' view of how networks function and what they do 'behind the scenes'. A set of additional questions then emerge for our attention: what does the membership of city networks look like? What is the organisational structure of networks? What resources

(e.g. budgets) do they have at their disposal? And, are more economically globalised cities more likely to be part of these initiatives?

From this point of view we could argue that scholarship's bias towards the Global North and climate change is also mirrored to some degree in the actual practice: as shown in Figure 1, we find that there also remains a developed country skew in city network membership~ – a finding that confirms existing scholarly concerns from the early 2000s (Bansard et al., 2017). The city membership of networks founded during 1885–1967 is chiefly in Europe, with peripheral membership in North Africa, the Middle East and Asia. The city membership of city networks founded during 1979–1989 is in absolute terms the largest of the observed time periods. This includes the significant expansion of network-participating cities across the Middle East, Africa, Asia and Latin America. The membership of networks founded during 1990–2001 and 2003–2016 shows again a Euro-centric bias, testifying to the important role that European Union initiatives (such as the URBACT programmes) have had in prompting more formalised city networking on the Old Continent. Yet, it also continues to show a growth in the number of 'Global South' cities involved in networking. When accounting for international (regional and cross-continental) networks, total membership accounts for 10,536 member cities, speaking very clearly to the presence of these networked connections in many cities beyond the usual 'global city' suspects.

The organisational landscape of city networking is also telling of a wide complexity. What form do city networks take? Most city networks have a 'one-tier' shape, with a single central secretariat and a membership of cities equal in status to each other in the network. Yet, other types of networks are nowadays also present on the international stage: 18% of networks are now 'two-tiered',

with a central secretariat coupled to subnetworks (some of which with secondary secretariats) or other forms of secondary organisational structures. And 11% of our 202 networks are interestingly 'pluralised' in that they do not have a single centre of organisational administration and manage their affairs in a flatter way.

However, is this expansion of networks really sustainable? Our more in-depth survey~ results might again be telling. The majority of our (sample size) city networks have an annual budget over US$250,000; 36% of respondents declared having a budget between US$1 million and US$5 million, 6% have a budget between US$5 million and $10 million, and there are at least three known cases of networks operating above the US$10 million mark. On the other hand, a sizeable portion of city networks (24%) have a budget between US$50,000 and US$250,000, and 3% even lower than US$50,000 per year. Budget trends in networks are as varied as budgets themselves, painting a diverse picture where many have seen some increase in resources (16% substantially, 29% in some form). Yet, one-quarter of networks (24%) are seeing some or even substantial budgetary decreases. It is also important to note that, whilst international networks are on the rise, there is an overall negative trend in declining or stable (and, especially in the EU, in many cases term-limited) budgets for regionally focused international networks.

This is also coupled with another worrying fact emerging from the 100-network sample survey~: if 69% of networks report regular (biannual or less frequent) reviews of their own operations, only 15% do this by putting themselves in the context (comparatively, via benchmarks or other systematic assessment tools) of the operation of other city networks. Significantly, even when removing national networks from the equation, this number still sits at a total 18%. In

short, with uncertain budgets and limited appreciation of the overall landscape, city networks need more evidence-based strategies. This is certainly mirrored in the practice of several networks. Many, such as Eurocities, UCLG or the WHO Network of Age Friendly Cities, have been putting quite some emphasis on impact analysis of their operations, but more of these efforts are needed. The issue of budgets and budget trends has, perhaps, brought this even more to the fore. This was made clear by the recent decision by the Rockefeller Foundation to stop funding to the 100 Resilient Cities network, which, since 2015, had invested over US$185 million in resilience initiatives across a vast variety of cities on the five continents. Some networks are thinking more strategically about funder diversification but this dimension of city network operation still remains very much 'behind the scenes' and with little public discussion, for instance about the challenges of shifts in philanthropic or national funding agendas. This is not just a scholarly or indeed urban dwellers' concern, as to where for instance municipalities pay network membership dues, but also a challenge for network managers themselves who often have to rely on word of mouth, off-the-record tips from colleagues and some competition research to make strategic funding decisions as to their operations. Once again, this is an additional reason to grasp the institutionalised form of city networks and the relationship between them (and other actors) within the broader landscape of global governance.

The geography of membership

The story so far tells us much of the complex political-economic and organisational shape of the global landscape of city networks. Yet, often, as we noted above, much of the conversation on these transnational initiatives tends to then selectively focus on

certain globally visible networks or indeed on specific situated experiences (e.g. Heikkinen et al., 2019). From this viewpoint what we tend to miss, then, is a more complete picture of how cities, and other actors, interact to weave the complex web of networked relationships that over 300 city networks cast globally in international affairs. Leveraging membership data and partnership lists available in our sample of international networks (100 networks in total), we employed a SNA to give clearer form to this global landscape. This was designed to offer a first-of-its-kind assessment of the geography of city membership within, and the partners of, these networks. Our 'full' network of networks to be mapped via SNA comprises 11,596 nodes and 16,369 edges: these include member cities (10,536) as well as a series of formalised network partners, which are predominantly split between businesses (329) public institutions (443) and research institutions (94) – a total of 866 partners overall as of 2017. This large geography of non-city partners underscores the complexity and public–private nature of the ecosystem of city networks – likely, as we conclude below, only the tip of the iceberg of actors and connections that constitute global 'urban' governance today. Besides, this vast membership already highlights how city networking is not just a 'global city' affair: many mid- and even small-sized cities in both developed and developing contexts are now busy engaging with peers beyond their national boundaries. Echoing a debate now well-rehearsed in geography, the conversation on city networks must step beyond simplistic global city models but also not be dismissive of the values of thinking of (most) cities as globally interconnected (Van Meeteren et al., 2016).

To avoid simply picking the 'top' cities by sheer number of network memberships, we focused here on centrality scores.[2] For example, while Berlin and Malmö are equal

Table 1. A comparison of the top-ten cities by network membership, business proximity and public-sector partners proximity˜.

Network memberships score	Business partner proximity score	Public partner proximity score
Barcelona	Barcelona	Paris
Paris	New York	Brussels
Brussels	Seoul	Helsinki
Helsinki	Paris	Barcelona
Melbourne	Buenos Aires	Moscow
Berlin	Quito	Montreal
Buenos Aires	Rome	Dakar
Rome	Milan	Seoul
Malmö	Medellín	Zagreb
London	San Francisco	Rome

in the number of networks they are signed up to, Berlin has a wider access to other cities by being a member of larger networks. As shown in Table 1 depicting the top-ten ranking of cities by connectivity to other cities via mutual city network memberships, Paris currently maintains the top spot by this measure. Importantly, this is not just a matter of city ranking: rather we rank to emphasise the close network proximity of cities and other internationally active players such as major businesses and governmental actors seeking to highlight, at the same time, that the geography of city network membership is largely also not an evenly flattened one, with some cities more tightly intertwined within this landscape than others. Equally important, this also underscores the need to see networks as communities of practice allowing cities to access peers experiencing similar challenges overseas. Of course, network membership does not equate to activity. Participation in networks varies substantially from extremely proactive 'organisers' to relatively passive members, if not laggards. This is in fact a central tenet of the depiction of networks in the environmental studies literature (Lee and van de Meene, 2012) with some even arguing, as did Kern and Bulkeley (2009), that city networks might largely be 'of and for pioneers'.

As such, participation in networking remains a relative conundrum in the absence of wider and more detailed qualitative analysis of the 'everyday' operation of these institutions, as much as more in-depth assessments of their political economy – something we flag as an important avenue for further research in our conclusion.

City membership in city networks also shows a distinct economic geography, which brings the subject of cities in global governance into direct dialogue with another parallel tradition of thought, that of cities in the world economy. The world economy is one structural totality, of which urban economies are a crucial part, including those of city network member local governments. Much as cities in our city networks data vary in the number of their simultaneous memberships, so too do city economies in their relative power in the world economy. Scholars in the tradition of the world city hypothesis posit that a network of world cities is formed by inter-city flows of capital, where relative centrality in this network determines a city's power in the world economy. This is most accurately measured by what is called the world city hierarchy, a relational measure of how central an urban economy is (Taylor and Derudder, 2015). City-level position in the world city hierarchy is consequential for
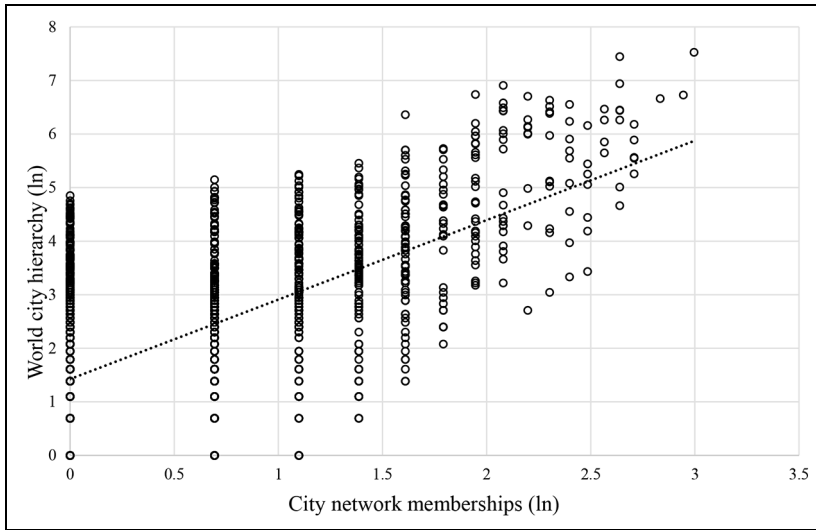
Figure 2. Relation between a city's 'world city hierarchy' position and international network membership˜.

local political-economic outcomes (Smith and Timberlake, 2001), which we find also appears to be the case for city memberships in city networks.

We create a new world city hierarchy to match the time frame and comprehensive nature of our city networks data,[3] and show in the scatterplot in Figure 2 the linear relationship between all 10,536 cities with minimum one city network membership and their rank in the world city hierarchy. A strong positive relationship is present, with a Pearson's correlation test yielding an R^2 of 0.7.[4] This relationship reveals that the structure of city participation in global governance via city network memberships is shaped in part by centrality in global capital flows, or relative power in the world economy. That the number of simultaneous city network memberships among cities rises concomitantly with rank in the world city hierarchy may be explicable in terms of both knowledge-seeking behaviour and marketing behaviour by city governments. Higher rank in the world city hierarchy translates to larger volumes of business profits in the

local tax base and thus larger municipal government budgets. This provides more budgetary and personnel capacity to join city networks and supplement policy knowledge resources to better manage a range of urban governance problems.

Second, while many cities join city networks to learn best governance practices, many others also join to additionally market their own governance best practices and gain recognition as leaders in certain policy areas (Curtis, 2018; Lee, 2014). City governments cultivating highly effective governance practices and policy entrepreneurship often take advantage of proximity to private service firms, either outsourcing areas of public service entirely or improving areas of public service delivery via contract. Such firms comprise the bulk of the world city hierarchy, specifically advanced producer services firms covering a range of consulting, law, marketing, construction, accounting and other services (Beaverstock et al., 1999). Cities ranked higher in the world city hierarchy have more immediate and diverse access to these firms, utilisation of which may

translate to the kind of highly efficacious policy entrepreneurship that city governments wish to market globally via city networks.

These findings do not directly speak to which cities are excluded from city networks but rather which cities are most involved and why. Separate analysis is needed to assess the geography of cities with no city network memberships, or those off-the-map, so to speak. City governments can better signal leadership in policy entrepreneurship via more city network memberships. In sum, cities commanding greater flows of transnational capital have the greatest representation in city networks, raising the question of whether the assumed 'horizontal' plane of transnational city governance is in fact stratified by economic power, and what implications this may carry for the rest of the world's cities (Leffel and Acuto, 2018).

The geography of partnership

The global growth and complex geography of city networks tells us that what city leaders do 'abroad' is far more than just connecting with other mayors. This way of 'city-to-city cooperation' (Bontenbal and van Lindert, 2009) or 'city twinning' (Jayne et al., 2011) might in fact be a generation of networking that has now been surpassed by a far more 'multi-stakeholder' (Pattberg and Widerberg, 2016) mode of engagement – an approach well aligned to these kinds of tripartite partnerships advocated in the implementation of the SDGs (Valencia et al., 2019). Within the limits of 'gridlock' of the current multilateral arena (Hale et al., 2013), this feature of city networking offers much promise as to the possibility of linking global agendas, different globally active actors and crossing sectors. Yet, to date it remains widely ignored in conversations about the need to rethink global governance institutions and reforming the edifice of geopolitics

as, for instance, represented by current conversations about the redesign of the UN system. Reference to cities in these debates remains anecdotal and curiosity-based rather than becoming tangible and actions evidence of the type we advocate here, and that could shape the reform of international organisations. Underscoring the important mediation role that cities are acquiring in this context, both bridging 'local' and 'global' politics (Curtis, 2016) as much as mediating the encounter of multiple forms of 'new' international actors beyond the state, our data set is rich in formalised non-local government actors participating in city networks.

To capture this reality, we analysed city networks specifically by partner type, looking at the private- and public-sector actors that are formally set up as partners of the 100 international networks at stake here. We created two networks-by-partner data sets that include networks with a minimum of one business and public institution partner, respectively, and the corresponding network member cities of each. One of the major findings is that most of the formalised business partnerships are with environmentally focused networks: 26 environmentally focused networks are partnered with 205 businesses, whereas all other networks are partnered with 129 businesses. This is most likely explicable by the ability for such partnerships to improve service provision by environmental networks. For instance, C40's partnerships with Siemens and Honeywell provide an immediate pathway for member cities to enter into energy performance contracts and perform building retrofits necessary for climate change mitigation, as was the case for Houston and Melbourne. In terms of the public sector, the EU and agencies within the broader UN system emerge as those with the greatest role in international city networks. Entities such as UN-Habitat, UNESCO and the World Health

Organisation are the major public counterparts of city networks. This highlights that multilateral, rather than national, public-sector agencies are the greatest supporters of the global geography of city networks. In a time of geopolitical tension questioning the role of multilateral institutions in world politics, these findings underscore the continuing importance of UN agencies in promoting this internationalist geography of city interactions (Curtis and Acuto, 2018; Elmqvist et al., 2018).

Only a few countries, such as Germany with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the UK's Department for Business, Energy and Industrial Strategy (BEIS) or the Swiss Agency for Cooperation and Development (SDC), emerge in the international picture painted by our database. Notably, and highlighting the often-overlooked centrality of development to the internationalisation of cities (Pieterse, 2013) contra the vast scholarship on cities and environmental issues which often overshadows this, many of these government actors are cooperation- and development-aid-oriented ministries. Likewise, as perhaps only clearly acknowledged in literature looking at cities in climate change (e.g. Johnson, 2018) or in global health literature looking at the Healthy Cities movement (Kickbusch, 2003), these data also prove the relative centrality of the UN system in supporting the internationalisation of cities, at least in a formalised way. This is also pointing to the important relationship between local authorities and UN agencies and their mutually influential 'glocal' dynamic at play here in advancing an 'urban age' agenda on an international stage (Angelo and Wachsmuth, 2019).

This also allows some initial conclusions on member cities' proximity to businesses and public institutions – something we, however, would like to tread really carefully on not to promote once again purely agonistic forms of comparison (Giffinger et al., 2010). By this measure (Table 1), Barcelona, New York, Seoul and Paris emerge as the cities closest to most business in this global geography. Yet, this does not rule out key Global South cities: Buenos Aires, Quito or Medellín are just short of these often commonly touted top 'performers'. When it comes to the public sector, Paris, the top networker by this measure, Barcelona, Seoul and Rome are still in the top ten, but other cities emerge as more connected to public agencies than businesses, as with Brussels, Helsinki or Dakar. Compared with business links, this is perhaps a less Global South balanced reality and a more European-centric image of the global geography. More generally, then, these data gesture towards the need to better understand the role of business, not just multilateral and governmental agencies, in 'internationalising' local government action. If some recognition of the necessity for a more explicit research agenda on the impact of networking in city leadership is now present in urban studies (Davidson et al., 2019), we still have little systematic evidence as to how business actors determine the pathways to global participation, the underlying power and influence as much as the formalisation of cities in global governance, with again the only clear advocacy for this type of research programme confined to global environmental politics (Hsu et al., 2019). Overall, however, city networks are still not extensively engaged in either these or, perhaps even more starkly, other fundamental global agendas such as that on disaster and risk reduction set out by the UN in Sendai in 2015. From our sample size~, only 47% of networks have demonstrated a formal engagement in Habitat III, SDGs and the Paris Agenda, with the number fast declining to 18% when it comes to the Sendai Framework for Disaster Risk Reduction and the Addis Ababa Action Agenda for

financing sustainable development. This is a critical issue because engagement is but a first step in taking serious action on a global scale. At present, networks tend to more formally link 'across' (connecting cities) than they do 'upwards' to multilateral actors and frameworks – an issue that we have already demonstrated to be problematically connected to the challenge of 'scaling up' action on global challenges such as climate change (Leffel, 2018; Smeds and Acuto, 2018). Even more importantly, our findings also highlight some continuing questions of North–South imbalance that must still be addressed if we are to tackle global sustainable development questions more collectively and universally (Nagendra et al., 2018).

From networks to 'global urban governance'

In a time of uncertain national politics and shifting global markets, the horizon of city leadership is now one that extends across boundaries, continents and geopolitical divides. This is a new frontier for urban governance that is increasingly tangible as cities mobilise to institutionalise partnerships with peers in formalised organisations whose main membership is local governments – what we called 'city networks'. Our main goal in this research note was to highlight their geography and geopolitics, going beyond the single case or the anecdotal, making an evidence-based case for understanding these entities as institutions, and as part of a large ecosystem of them, which requires scholars and policymakers to understand both the products and influence of networks as well as their internal operations. Contra an often-tokenistic mention in the scholarly literature beyond environmental studies, our study sought to highlight the wide reach, vast membership and complex partnership picture that the global geography of formalised city networking implies,

and the complex political-economy it stands upon. This landscape calls for both scholars and practitioners to pay more systematic and evidence-based attention to the way cities link with each other, and with public and private partners, beyond national borders. When understood as a wide transnational movement, not just as sporadic or distinct entities, city networks are no short-lived fad. A major community of local government networking has been built over the last century, intent at this very moment on contending that the time of the city has come in ensuring sustainable futures. Yet, little to no systematic analysis of this networked reality is currently available to scholars or policymakers.

Ours is predominantly a call for evidence-based action by networks, not just a research agenda for academics. This does not mean, however, as some less empirical accounts might have boasted in the past few years, that cities and mayors can or do 'rule the world' (Barber, 2013). Centrally, as already advocated by Avant et al. (2010: 3) in their research agenda on global governors, it is imperative to better understand the 'character of relationships' that underpins these actors – but between them as much as between cities and international organisations. This means recognising that city networks might already be functioning internationally as more than just advocacy networks for activist mayors (e.g. Keck and Sikkink, 2014) or as knowledge networks (e.g. Stone and Maxwell, 2004), but rather as a form of networked urban governance that holds some potential for global governance but also raises key questions as to the place of cities in multilateral affairs. It is also fundamental to underscore that, whilst understanding the formalised dimension of inter-city networking is pivotal to appreciate changes in the structures of urban governance worldwide, we should not discard other forms of transnationalism as less relevant or

indeed secondary. As poignantly demonstrated for instance by Kathiravelu and Bunnell (2018) in a recent special issue on the social networking of friendship that shapes care and conviviality in cities, there is a wealth of informal and semi-formal links charting the connectivity of cities and, perhaps more importantly, urban dwellers. As such, our study is but a snapshot into what is certainly a much more complex ecosystem of global urban governance. Trans-locally networked institutions such as Slum Dwellers International (founded in 1996, covering 33 countries), Habitat International Coalition (founded in 1976, covering 117 countries) or the Asian Coalition for Housing Rights (founded in 1946, covering 165 cities) have had a long-standing role in mobilising international urban development efforts, campaigns and knowledge exchanges (e.g. Mitlin and Patel, 2014). What we point at here, then, is but the tip of the iceberg of urban linkages that we cannot disregard when speaking of cities and city leadership today.

To be certain, we are of course not arguing here for ditching the analysis of city networks more broadly or transnational municipal networks more specifically. Network analysis, whether in its SNA format or through more qualitative stances, still offers a promising approach that needs further exploration to capture even more systematically the 'emergent properties of persistent patterns of relations among agents that can define, enable and constrain' (Hafner-Burton et al., 2009: 559) cities as 'agents' (Acuto, 2010), not just 'places', in international affairs. Hence, as demonstrated above, we would encourage those wishing to embark on this kind of research to do so with attention to three main underpinnings that have grounded our study: first, that cities network (formally) across a vast variety of themes and issues and that our imaginary of how local governments 'go abroad' (Hobbs, 1994) needs to be wary of

both restricting our field of research to the environmental sphere or drawing conclusions from individual cases without reference to the wider landscape we have begun to describe here. Second, that these networks exist in an 'ecosystem' of networked connections, not in isolation from either each other or other actors in global and local urban governance. Third, as we have argued above and elsewhere (Acuto and Ghojeh, 2019), and as it follows from unpacking their 'internal' political economy not just their external relations, we should strive not to reify networks and to appreciate the complex reality within these institutions – from questions of membership and funding to their formalised connections to other actors in world affairs. Such an undertaking might, in fact, push scholars to work more closely with that vast cadre of 'urbanists', network managers, officers and supporters that operates in this ecosystem either within or across the institutionalised boundaries of these networks. This, in turn, paints a picture of a wide ecosystem of 'global urban governance' (James and Verrest, 2015) ripe for research engagement and proactive at driving the direction of how cities are governed and evolve in the 21st century. Understanding, and mapping, what the political and economic geography of this ecosystem entails is but a first step – better informed policy action by the networks and more in-depth research by network observers need to follow.

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Notes

1. We refer here to 'city networks' rather than 'transnational municipal networks' (TMNs), for two important points of differentiation of the database: it contains *national* city networks (e.g. UK Core Cities) that do not span national boundaries, as well as *internationally sanctioned* city networks (e.g. WHO Healthy Cities Network) which operate inter- rather than trans-nationally in so far as they do so via the state-defined structure of UN agencies.

2. To analyse network membership in our full data set, we used a city-network-city (2-mode) to city-city (1-mode) network transformation and take centrality scores, a higher score denoting more connectivity to other cities via common network memberships. Following Alderson and Beckfield (2004) we take centrality scores for both out-degree (headquarter) and in-degree (branch) ties per city.

3. Existing world city hierarchy metrics are both outdated and non-comprehensive. To match the comprehensive nature of our city networks data set, we create a new, near-comprehensive world city hierarchy metric using the 2016 data from the LexisNexis Directory of Corporate Affiliation, which represents all corporations earning at and over US$10 million in revenue. Building on Globalization and World Cities Research Network (GaWC)'s work, we coded all city-to-city connections via headquarter–branch ties of all corporate offices, covering 22,311 cities from 210 countries, comprising over 200,000 city-to-city headquarter–branch ties. Degree centrality scores per city were taken as the ranking in the world city hierarchy.

4. The log values of each variable were taken to reduce skewness and a Pearson's correlation test was performed between the full degree measure for the hierarchy – the sum of in- and out-degree ties for corporations between cities – and network memberships.

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